An MDM PUBLICATION
Issue 41 – March 2012

APF

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ASIA PACIFIC FIRE MAGAZINE

REPORTING TO THE ASIA PACIFIC FIRE PROTECTION AND FIRE SERVICE INDUSTRY

TASK FORCE TIPS, INC.

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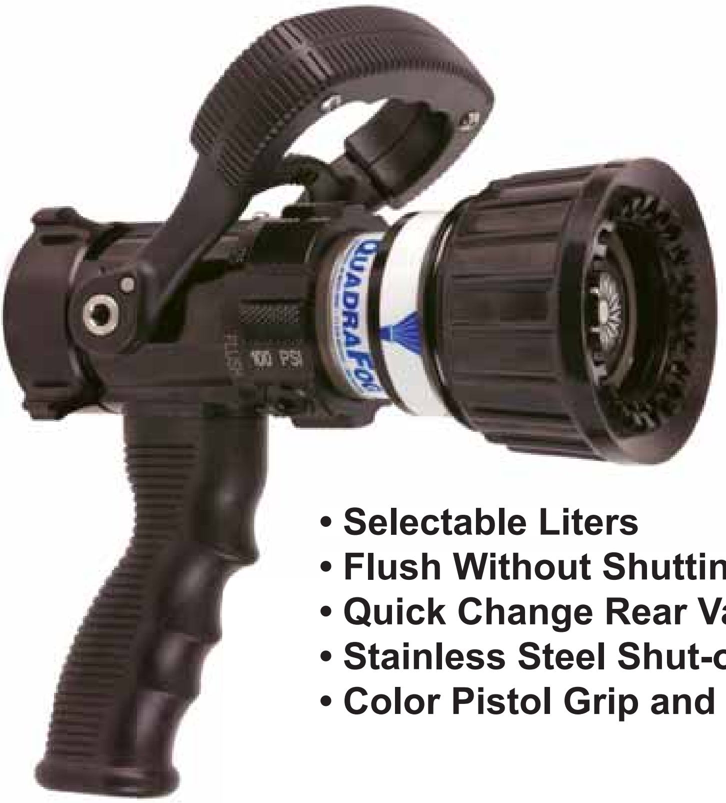
QuadraFog

110, 230, 360 & 470 l/min
Selectable Nozzle
Fixed or Spinning Teeth



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CROSSFIRE
Portable Monitor

MONSOON
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FIRE FIGHTING EQUIPMENT

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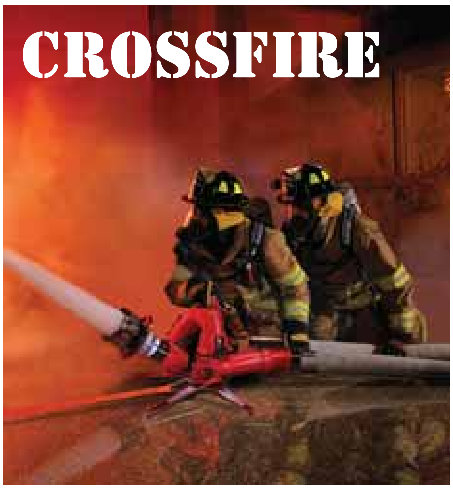
Personal Portable Monitor



4500 l/min (1250 GPM)
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New TFT G-Force Nozzle with Low Expansion Foam Attachment Applying AFFF Foam. Photo courtesy of Task Force Tips, Inc. www.tft.com

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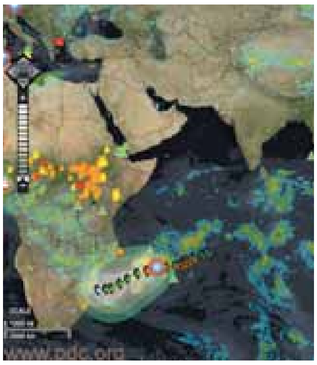

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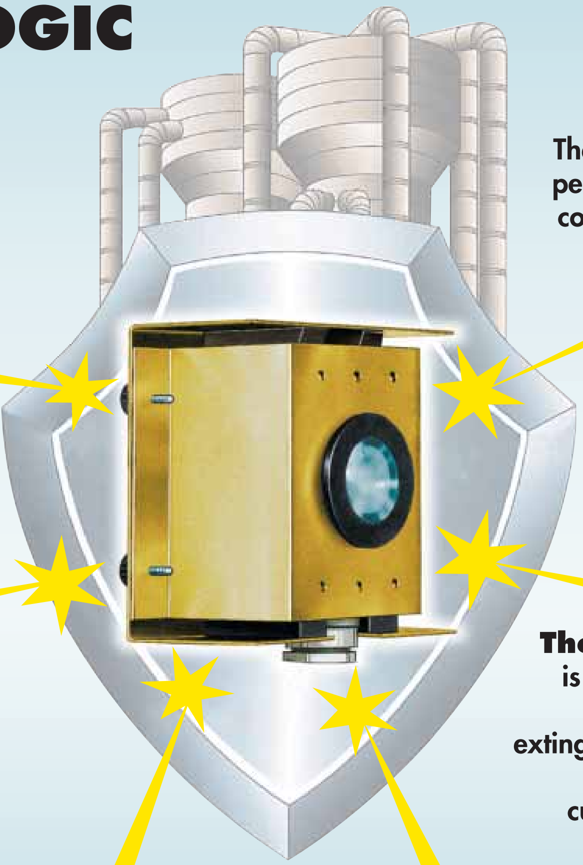
CONTROL LOGIC Spark detector

designed for dust collection systems to protect storage silos from the risk of fire.



Sparks fly at high speed.

They travel at a hundred kilometres per hour along the ducts of the dust collection system and reach the silo in less than three seconds

The CONTROL LOGIC SPARK DETECTOR is faster than the sparks themselves. It detects them with its highly sensitive infrared sensor, intercepts and extinguishes them in a flash. It needs no periodic inspection.

The CONTROL LOGIC system is designed for “total supervision”. It verifies that sparks have been extinguished, gives prompt warning of any malfunction and, if needed, cuts off the duct and stops the fan.

ISO 9001

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the IR FLAME DETECTOR
responds immediately

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the fastest and most effective fire alarm device
for industrial applications

**IR FLAME DETECTOR
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ENCLOSURE**

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Also for
RS485 two-wire serial line

**IR FLAME DETECTOR
RIV-601/F
WATERTIGHT
IP 65 ENCLOSURE**

For industrial applications indoors or outdoors where fire can spread out rapidly due to the presence of highly inflammable materials, and where vast premises need an optical detector with a great sensitivity and large field of view.

ISO 9001

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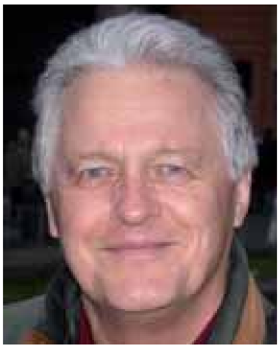

By Graham Collins

Why Didn't We Do Something?

As this edition of Asia Pacific Fire goes to press we are all no doubt reminded of the catastrophic events that occurred around this time last year in Christchurch, New Zealand and in northeast Japan. While devastating in the extreme for those directly affected, the courage, dedication and professionalism of those involved in the rescue operations ranks alongside the very best.

Significantly, one factor was common to both events and to similar natural disasters around the world – we had no idea that they were going to happen. Well that is, of course, not strictly accurate; it is more precise to say that we did not know when they would happen and with what severity. The knowledge that scientists now have about the geology of both regions, coupled with similar recorder past events in the same or nearby locations meant that they were both likely to be happen at some time.

In many respects that is the lasting challenge of these events and it is human nature to hope that such occurrences will not happen in our lifetime. But they do, and there is every reason to suppose that the incidence of their happening is likely to increase. As the world's coastlines become ever more populated, scientists are discovering that tsunamis are more common than was once thought and the coastline throughout the Asia Pacific region and along every Pacific coastline is a mass of what are being called "tsunami triggers".

How, if at all, we prepare for the inevitable is a challenge of monumental proportions. Japan is possibly the best prepared nation on earth when it comes to earthquakes and tsunamis, but the 5.5-metre high sea wall at Minamisanriku might just as well not have been built for the protection it offered. The little town simply no longer exists.

Most at risk are countries where the mass of the population live in coastal regions and where the coastal region land is relatively flat. The most vulnerable are children, the elderly and the infirm; those unable to make it to high ground in the very short space of time between receiving a tsunami alert and the unimaginably high wall of water hitting the shoreline. Even after they have crossed an ocean, Tsunamis remain extremely dangerous, moving at the speed of a jetliner, but those likely to strike in our region are not likely to be triggered by seismic events thousands of miles offshore. Unfortunately, our tsunami triggers are far more coast hugging.

The inevitable question at the back of everyone's mind must be: "What is being done about it?" If a politician's recent comment when referring to flooding preparedness was to say: "Let's hope Mother Nature will be kinder to us this year" is anything to go by, the answer is probably very little. Like the rest of us, those with control of the public purse strings are probably hoping that it will not happen in their lifetime.

There has to be some sympathy for that seemingly ostrich-like approach to the problem because the cost implications of taking meaningful steps are simply of mind-boggling proportions. The reality is that nobody seeking political office is about to ask the voters to dig so deep into their pockets that they will be virtually mining for their remaining small change. The cost would undoubtedly make the expenditure on flood relief preparations look like raiding the petty cash.

But something surely has to start somewhere, even if it is only public education, devising evacuation plans and imposing earthquake and tsunami-aware planning restrictions on new buildings and coastal developments. If not, one day, our children or our children's children will ask the question: "Why didn't they do something when they knew this was going to happen some day?" APF

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NFPA Conference and Expo Returns to Las Vegas

Olga Caledonia

NFPA

Time to plan your trip to the annual NFPA Conference & Expo – the year's most important internationally-recognised, comprehensive event for the fire, life safety, and electrical industries – where you can join NFPA experts and industry professionals from around the world. And this year it is back in fabulous Las Vegas between 11th and 14th June.

The event combines an unrivalled educational conference and an exhibition with more than 300 participating companies. You will want to take advantage of the convenient networking opportunities and gain up-to-date knowledge on the codes and standards many of which are used as worldwide practice or adopted by many governments around the world.

The Conference includes an impressive list of internationally recognised industry experts and new sessions focusing on changes to the 2012-edition codes. The education sessions are a valuable resource for new information that you cannot get anywhere else. With over 130 education sessions that will include many case studies, code updates, and results from various research projects. Topic areas are covered in 12 targeted tracks that include: Building & Life Safety; Codes & Standards; Detection & Notification; Electrical; Emergency Preparedness/Business Continuity; Fire & Emergency Services; Fire Protection Engineering; Fire Suppression; Green; Loss Control/Prevention; Public Education and Research.

In 2011 the event attracted more than 4,000 professionals from the US and approximately 77 countries, including an important number of delegations from Asia Pacific. We are already processing visa invitation letters for many of our constituents from China, Korea, Taiwan and Thailand! This is a unique opportunity for NFPA to gather the many volunteers and supporters of NFPA codes and standards in one place. The networking opportunities are endless and as Director of International Programs I would like to extend a special invitation to the Asia Pacific Fire readership. Every quarter we have the opportunity to visit with you through this impressive industry journal. During my travels I look forward to meet many of you in person and maybe greet a few of you in Las Vegas.

The three-day expo will showcase many of the latest technologies and services from more than 300 of the top solution providers. Knowledgeable representatives from these companies, many of them global corporations, will be available to answer your questions and offer solutions to your most pressing challenges. The exposition provides attendees the ideal location to see, touch, and try products, and to meet with a company's technical staff. As always, the expo is free when you register in advance. Please mark your calendars as the deadline for free registration is June 1st.

I would also like to highlight the value of the one, two or three-day individual seminars. This year we will be offering 20 comprehensive pre- and post-conference seminars. Some of these will be available only in Las Vegas. Besides the characteristic code seminars, a few of our popular offerings among our international constituents include:

- Behind the Scenes Tour: Fire Protection at Mandalay Bay.
- Special Suppression Systems.
- Disaster/Emergency Management and Business Continuity Programs (NFPA 1600).
- Public Assembly (NFPA 1).
- What Fire Safety Professionals Should Know, and Do, About Stairway Usability and Safety.

Between the conference and its 12 distinctive tracks, the new code certificate programs and the one, two or three-day individual programs, our audience can personalise their education and exchange with other professionals the latest in Asia Pacific, information that is critical to our mission and to professionals who care about doing things correctly.

I would also like to encourage everyone to become more active in the Conference and Expo blog and social media outlets. We want to hear from you! It is essential for our international constituents to become active in these mediums. You can visit our blog site at nfpa.typepad.com/conference. You can also follow us on Twitter at NFPAConf and like us on Facebook. You can always go to www.nfpa.org/conference for up to date information. APF

Olga Caledonia is NFPA Executive Director, International Programs

For further information, go to www.nfpa.com

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Rosenbauer serves military Airport Fire Services with innovative and professionally designed quality PANTHER ARFF vehicles.
Chassis, superstructure, extinguishing systems and the vertical pilot rescue lift are fully integrated, designed and manufactured within the Rosenbauer Group.

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Upgraded SCBA Unveiled

AVON PROTECTION has introduced the latest version of its Viking Z Seven SCBA (self-contained breathing apparatus) with the aim of equipping firefighting teams with advanced respiratory protection and communications technology.

The upgraded apparatus has undergone fundamental revisions to its functionality and electronics system. A revised cylinder connection assembly offers a larger cylinder hand wheel for ease of use with gloved hands, together with a luminescent pressure gauge and cylinder band for enhanced visibility in darkened or smoke filled environments.

The Viking Z Seven control console provides an easy-to-use advanced communications system with large push button design for use with gloved hands, and a voice amplification system speaker with ten voice threshold settings that reduce breathing noise. The entire electronics uses one source of power through its C4 power pack with an easier to check back frame location, supported by free battery supply for ten years PASS (Personal Alert Safety System), and all other NFPA required features, including heads-up display and complete CBRN protection.

The apparatus offers integrated communications, with voice amplification as a standard feature, and Air Switch technology incorporated into the facemask to enable immediate switch from ambient to cylinder air when required. An ultrasonic beacon can assists in downed team member location while a tracking device can be mounted to a thermal imager for combination ultrasonic tracking and thermal viewing.

In addition, an integrated air management teletry system relays vital SCBA information to enable command centres to monitor cylinder pressure, real time temperatures, PASS status and SCBA battery status. A one-button operation can recall either one or the entire firefighting team in an instant.

For more information, go to www.avon-protection.com

Sulfide Gas Detector is IP approved

DET-TRONICS has announces that its nanotechnology metal oxide semiconductor hydrogen sulfide gas (NTMOS H2S) detector has earned approval for use in locations that require an ingress protection rating of IP66/67. The rating was achieved as a result of the detector's robust mechanical design and indicates that the gas detector is protected against dust and forceful water during operation. The ingress protection filter and guard protect the detector in tough offshore situations and are fully replaceable in the field.

The new certification joins a list of other previously obtained approvals and certifications for the NTMOS H2S gas detector, including CE (Conformité Européene or European Conformity), CSA International, ATEX, IECEx, FM tested and certified to ISA-92.0.01. The NTMOS boasts a speed-of-response performance that detects H2S in six seconds (T20).

For more information, go to www.det-tronics.com

New Aerial Firefighting Platform for Thailand

CTE SpA has delivered a B-Fire 360 aerial firefighting platform with a working height of 36 metres and a 450kg basket capacity to the Lampang City Municipality, the capital city of Lampang Province some 640km north of Bangkok, Thailand

The B-Fire platform is available with or without the side ladder and comes with a wide range of options. It has a telescopic jib and the basket allows access for four firefighters with full equipment. The platform also includes a side staircase made of aluminium alloy, an integrated electronic system, three command posts and an automatic stabilisation system.

For more information, go to www.ctelift.com

Stand-Alone Solution for Wireless Gas Detection Systems

To solve what it sees as the challenge of keeping gas detection systems constantly powered when conducting remote exploration operations and working in hazardous and rugged environments, RAE SYSTEMS has introduced SolarPak, an intrinsically safe, stand-alone 24/7 remote solar powered solution for wireless gas detection systems.

SolarPak complements RAE Systems' PowerPak by delivering an uninterrupted power supply that enables its MeshGuard Gas Detection Systems to monitor gas in remote exploration sites 24/7 – particularly in areas where flammable gases or vapours present a health or safety threat.

It is claimed to be the only solar solution certified for Class I, division I (ATEX Zone 0) hazardous locations, and is compatible with all RAE Systems MeshGuard wireless gas detectors and Mesh Routers. SolarPak features an integrated solar panel and charge controller to charge the RAE PowerPak external battery, which enables continuous operation of gas detection systems. The solution is claimed to dramatically reduce labour and maintenance costs by eliminating the need for expensive trenching and cabling or periodic changing of batteries.

RAE Systems' MeshGuard wireless gas detection system is a battery operated, rapidly deployable hazardous area monitoring system that combines advanced gas-detection technology with the latest in wirelessly connected data systems. Its rugged design delivers reliable performance in harsh and potentially hazardous industrial environments, such as oil refineries, oil and gas exploration, oil and gas production, and tank farms. A complete MeshGuard gas detection system can be deployed in minutes, and will operate continuously – even in cloudy conditions – with the RAE PowerPak and SolarPak. The standard pole and wall mount adjust easily to maximise energy production at different geographic locations.

For more information, go to www.raesystems.com

New LED Portable Floodlight

The Aurora LED portable floodlight is the latest innovation from NITECH. It is said to utilise the very latest LED and design technology, and address the market's growing hunger for 'green technology'.

What is described as "unique rechargeable technology" has been incorporated into the floodlight to enable users to benefit from carbon-footprint savings, offering an annual CO_2 saving of up to 3000kg. At the same time, overall efficiency is claimed to be ten times that of conventional site lighting. The Aurora's maintenance-free battery enables it to operate for 10,000 hours before it needs to be replaced, while the LED light source offers an operating life of 100,000 hours.

The Aurora produces wide-angle, daylight-equivalent light output with shadow-free illumination to suit both task and general lighting applications. Offering cool running, it can be utilised in confined spaces and has an IP68 waterproof rating to suit the demands of exterior environments. It offers multi-voltage rapid recharging from 200 volt to 230 volt AC and from 100 volt to 130 volt AC with other voltages available. These floodlights can also be recharged via a 12 volt vehicle battery. A visual and audible warning provides effective indication of a low battery during operation.

They can be used as a maintained lighting system for emergency applications. When linked to the mains supply or generated power source, they can operate continuously while retaining their full power reserve. Auto switching models are also available.

For more information, go to www.nitech.co.uk

New Wireless Team Communication

Team communication solutions provider, SONETICS, has formed a partnership with Logic Energy, a distributor of wireless solutions in Australia and New Zealand. Under the deal, Logic Energy will market Sonetics' wireless headset systems for a variety of critical communication applications, including fire and rescue.

Sonetics' systems support hands-free, full-duplex communications up to a 600-meter range while also monitoring up to two radio channels and providing push-to-talk radio transmission from the users' wireless headsets. The headsets provide 26dB of hearing protection and are completely wire-free, with no external antennas, belt packs, or wires to snag or entangle users. A battery management system delivers 24-hour continuous operation for each charge and two-hour full recharge, ensuring that the headset is ready to operate up to a year after the last charge.

Sonetics' solutions are compliant with frequency requirements in Australia and New Zealand, as well as most Asian countries.

For more information, go to www.soneticscorp.com

TITANUS

– the Patented Advantage

Thanks to their outstanding reliability, sensitivity and false alarm resistance, Titanus air sampling smoke detection systems have been the tried and proven system of choice for many years in a wide variety of applications.

Especially in areas with special detection requirements and difficult environmental conditions, Titanus systems incorporate impressive technological advantages unmatched by any competing system. WAGNER has consistently demonstrated its leadership position in this area with its comprehensive range of design options and a broad selection of "tailor-made" accessories. This is part of Wagner's long history of innovation in the global smoke and fire alarm arena.

High-value/high risk locations such as those with high concentrations of valuable assets, irreplaceable objects, and operations requiring uninterrupted IT/data centre availability require the utmost in fire protection.

Titanus air sampling smoke detection systems offer significant advantages in the implementation of the appropriate concepts designed to fit individual requirements.

Increased Reaction Time Due To High Sensitivity

Wagner has introduced a critical advance in fire detection technology with the High Power Light Source (HPLS). HPLS is more robust and reacts more sensitively to smoke particles than commonly used laser technology. It also allows Wagner air sampling smoke detection systems to operate at temperatures as low as 40°C with sensitivity levels one thousand times higher than conventional smoke detectors. Titanus air sampling smoke detection systems react much faster, allowing quicker response to emergencies.

Logic·Sens Signal Processing Equals Improved False Alarm Immunity

Integrating years of real-world experience with extensive laboratory testing, Wagner has fine-tuned its patented Logic-Sens signal processing software so that Titanus systems provide extremely sensitive early detection of real fire scenarios while reliably ignoring false alarms – even in extremely difficult or hostile environments. Intelligent Logic-Sens signal processing software constantly compares air samples from the protected area against known fire parameter patterns, providing the earliest possible fire detection.

Modular System, Simplified Installation and Reduced Maintenance Equals Lower Cost

Titanus air sampling smoke detection systems are noted for their cost-effective modular design, providing substantial benefits to designers, integrators, installers, and end-users. Add-on detector modules increase the area of protection and reduce the number of detectors needed. Titanus is designed to save time required for system design, installation, commissioning and maintenance. Over the service life of the system, these benefits result in clear cost advantages over other technologies.

Monitored Pipe System

Wagner's highly precise Pipe-Guard patented air flow monitoring system constantly monitors the entire pipe system for breaks and obstructions. The system is adjustable and can react to changes in air flow of as little as +/- 10%. Pipe-Guard is also temperature-compensated to maintain consistent airflow.

Solution for Noise-Sensitive Areas

Silent technology from Wagner is particularly well-suited for applications where architectural aesthetics or the need for very early fire detection must also combine with the need for quiet operation. Titanus Silent systems operate at noise levels as low as 23 dB (A), which sets a new standard among aspiration smoke detection systems. Wagner's Silent technology easily complies with national and international noise protection directives, for example, World Health Organization "Healthy Sleep": 30 dB (A).

Reduced Installation and Maintenance Requirements

Wagner's "Plug & Play" feature makes it easy to commission Titanus systems quickly and easily without the need for any additional equipment. All standard functions are either preconfigured or easily adjustable, and with diagnostic tools as well as modular construction, maintenance and component service are minimised.

Individual Room Identification

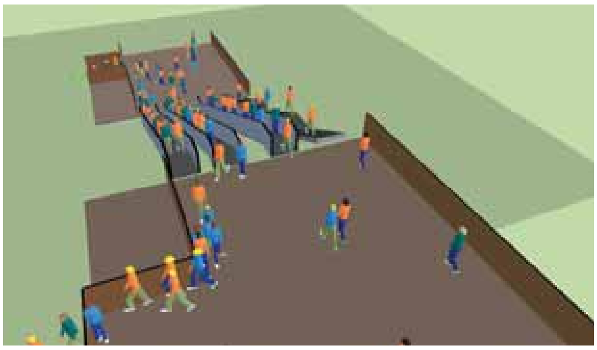
Wagner's patented Room-Ident feature provides an inexpensive method for using one detection unit to provide individual monitoring of up to five rooms.

Networking – Connectivity

Optional Titanus networking cards provide interfaces for TCP/IP and SNMP communication as well as webserver functionality for remote diagnostics and data logging.Wagner is a Microsoft Partner supporting the Microsoft System Centre Operations Manager (SCOM). APF

For more information, go to
www.wagner.de

Software Simulates Crowds and Evacuation



The UNIVERSITY OF GREENWICH in the UK has released the next generation of its evacuation and crowd simulation software called buildingEXODUS, created by the university's Fire Safety Engineering Group. This latest release – known as Version 5.0 – has new capabilities that will enable building engineers to perform the most realistic desktop simulations that have ever been possible, predicting not only how individual people interact with each other and the built environment, but also how they can be debilitated by hazards such as heat, smoke and toxic gases.

Version 5.0, draws extensively on data and experience captured from experiments and real-life incidents. Its human behaviour 'submodel' includes rules governing the often complex behaviour of people affected by smoke in fire situations and the use of signage in an emergency. It also examines the psychological aspects governing how, and why, people select an escalator or an adjacent staircase as their escape route.

Since its launch in 1996, the buildingEXODUS package has been used by engineering consultancies, architects, research laboratories, regulatory authorities, police forces, fire brigades and universities in 37 countries. The package has also been used to model the evacuation capabilities of a wide range of proposed or existing buildings and crowd situations, from the Love Parade disaster analysis to the Beijing Olympics, and from the World Trade Centre investigation to the Statue of Liberty redevelopment. The software is used in design analysis for underground stations, high-rise buildings, hospitals, shopping complexes, school buildings, museums, theatres, airport terminals, sports stadia and external crowd events; virtually any type of situation involving the gathering or movement of people.

For more information, go to http://fseg.gre.ac.uk/

New IR Beam Detector

A new end-to-end infrared optical beam smoke detector has been launched by FIRE FIGHTING ENTERPRISES. The new Fireray 3000 is claimed to be a particularly cost effective solution for the protection of large, open-area spaces, and in situations where ceiling-mounting is difficult or inappropriate, requiring small numbers of units to cover very large areas.

It has been designed for applications where line-of-sight for the IR beam path is narrow, or where the building structure uses particularly reflective surfaces, which may cause complications for reflective beam system installation. Each element of the package has also been designed to be both discreet and aesthetically pleasing, helping them to fit well into every environment from modern architectural buildings to ornately-decorated heritage sites.

Installation is quick and easy, and can be completed by a single operator. A visible targeting laser housed in the receiver head aids initial placement and setup, showing clearly the beam path and the necessary positioning for the units. During commissioning the LEDs on the heads also light up to help fine-tune the alignment path, showing the installer in which direction adjustment is needed. Both of the detector heads have integrated alignment thumbwheels for simple, intuitive and repeatable targeting adjustment, with up to ten degrees of motion available on both horizontal and vertical axes.

For more information, go to www.ffeuk.com

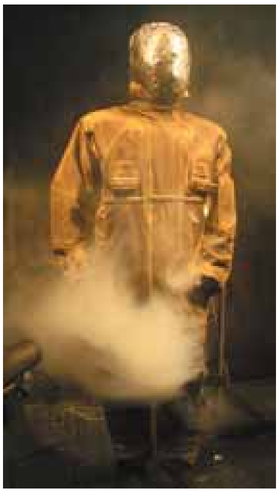
New Hydraulic Portable Tank System

ZIAMATIC has introduced a hydraulic portable tank system that combines its portable tank system design with the added strength and reliability of self-contained hydraulic actuators. Called the PTS-HA, Ziamatic says that it provides a more even, parallel operating motion. The hydraulic actuators create a stronger, more rigid system, allowing for a hard cover and one hard sleeve to be mounted directly to the tank box. No additional hardware or adapter kits required.

The PTS-HA securely stores a portable tank over the side compartments of an apparatus and lowers to a convenient height at the flip of a switch for quick, easy, and safe tank retrieval. The rugged, cast aluminium system sustains a maximum load of 225kg and is capable of stowing portable tanks up to 910mm high by 230mm wide when collapsed. It is available for installation on new or existing apparatus and is NFPA compliant.

For more information, go to www.ziamatic.com

Top Performer in Independent Tests

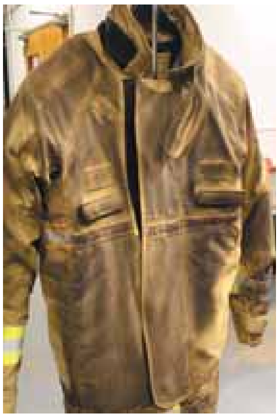


PBI Gold after the eight second burn test on "Ralph"

It takes real confidence in your products to hand them over to an independent test facility to be compared to other fabrics in the market and then invite customers to see how they perform. But that is exactly what PBI Performance Products did recently when they arranged for senior fire service delegates from brigades from across Europe to a series of test burns in Manchester in the UK.

The company is so confident of the performance of its fabrics that it believes it should always let its products do the talking. It is a belief that was vindicated at the event in Manchester as PBI fabrics once again showed, under independent test conditions, that they deliver a higher level of burn protection, without shrinkage or break-open.

The tests were held at the British Textile Technology Group (BTTG) test laboratory and delegates had the opportunity to see six burns. The structural fire suits that were used were all made by the same manufacturer and incorporated the same designs, thermal and moisture barriers. The only difference between the garments was the outer fabric. Three were made with PBI Gold 200gsm, PBI Matrix 205gsm and PBI Gold 220gsm fabrics. The other fabrics were a MetaAramid-imid 220gsm, MetaAramid 200gsm and a MetaAramid 220gsm.



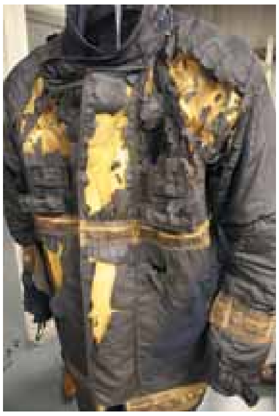
PBI Matrix after the burn with no evidence of shrinkage or break open

After an eight-second burn at 1000°C all of the PBI fabrics retained their strength and flexibility, with no evidence of shrinkage or break-open, even after extensive flexing of the garment. All three of the other fabrics showed evidence of shrinkage and started to break open in varying degrees as soon as they were flexed.

A firefighter's most important line of protection and defence is the clothing that he or she wears when fighting fires. Their structural kit has to protect from the most extreme situation in a

Fire – a flashover – even if it is not an everyday occurrence. A report on firefighter PPE, undertaken by the Centre for Research in Textile Protection and Comfort at North Carolina State

University in 2004, identified break-open in the outer fabric as a risk to burns. It said, "The results indicate that when the shell material is removed (broken open and lying on the ground) the time to achieve a 2nd degree burn, or the thermal protective performance of the turnout gear system decreases by about 35%."



Suit without PBI. After flexing it showed evidence of shrinkage and started to break open

If caught in an intense fire or flashover the firefighter is not going to stand still, so it is vital that the outer fabric can withstand the flexing that will occur from natural movement such as crouching or walking. Because PBI fabric protects the integrity of the internal layers of the garment the transfer of any radiant heat is slower, allowing more time for firefighters to escape to safety.

PBI Gold during the burn

Helmut Zepf, Vice President, International Sales and Marketing at PBI Performance Products Inc. said: "At PBI we believe that our products speak for themselves, which is why we think it is important that our customers have the opportunity to compare fabrics in an independent test environment. It is the only way to make a valid comparison. All of the PBI fabrics consistently maintained their integrity with no signs of shrinkage, brittleness or break-open, retaining most of their colour and durability."

The eight-second burn test was undertaken on the 2006 version of the male heat sensing manikin known as RALPH, which was developed by BTTG and conforms to ISO 13506. For the test the hands and head were not used, leaving 123 sensors on torso, arms and legs that monitor the temperature on the surface of the manikin during the test. The manikin was challenged by a flame engulfment apparatus that consists of two tiers of six burners that create heat flux of 84kW/m^2. The garment was exposed for eight seconds and data from the sensors was collected for two minutes.

All PBI fabrics, whether from the company's Gold or Matrix ranges, are lighter and considerably softer than others available on the market, yet they consistently provide more flame and heat resistance, offer high standards of durability and will offer the same high level of protection to firefighters throughout the lifetime of their PPE. APF

For more information, go to
www.pbiproducts.com

New Foam-induction Water Monitor

ANGUS FIRE has launched Polaris, a foam-induction water motor to complement its existing range of foam-making equipment. It is designed to deliver 1%, 3%, 6% or dual-rate foam induction within Underwriters Laboratory (UL), Factory Mutual (FM) and EN standard limits, across a wide range of flows and pressures.

The water motor is driven solely by the extinguishing water flow, requiring no external energy source. The water flow drives a rotor connected to a foam pump, which pumps foam concentrate into the water motor outlet, creating the firefighting water/foam solution. The system is flow-proportional – the higher the water flow, the more foam is inducted, to maintain the correct concentration level.

Major benefits being claimed for Polaris include minimum water and line pressure loss. Foam concentrate can be supplied from a tank at atmospheric pressure, which can be refilled at any time without any need to interrupt firefighting activities. Polaris is manufactured from high-grade, corrosion-resistant materials that are compatible with seawater, ensuring that it can be used in a wide range of environments, including offshore and marine installations. Polaris induction motors are designed to match normal water flow through a schedule 40 pipe system, and can be configured for static industrial systems and ring mains, including foam sprinkler systems. A de-mountable, portable version of the unit is available, which is suitable for use on fire and rescue vehicles.

For more information, go to www.kidde.com.au

Hydrogen Ordinary Hazard Sprinkler

VIKING CORPORATION has introduced what it claims to be the industry's first quick response, extended coverage, flat plate concealed fire sprinkler for Ordinary Hazard (OH) occupancies. The new VK538 Mirage sprinkler, which is cULus Listed for OH-1 and OH-2 occupancies, provides in these applications "the enhanced aesthetics of a flat cover plate with the design advantages of a QREC sprinkler."

With a K Factor of 11.2 (161), the VK538 is suited for systems requiring higher water densities, as well as situations where the available water pressure is limited. Potential applications being cited by Viking include casinos, hotel atriums, retail environments, libraries, automotive showrooms, and shopping malls.

The VK538 Mirage is Listed for coverage areas as large as 6.1 metres by 6.1 metres and has required flows and pressures that are less than or equal to most non-concealed sprinklers for OH occupancies. The new sprinkler has a 20 mm NPT thread size and is available in 74°C and 96°C temperature ratings. They are available in several standard finishes and a nearly unlimited number of custom colours.

For more information, go to www.vikingcorp.com

New USAR PPE

A new USAR coat and trouser has been added to BRISTOL UNIFORM'S firefighter PPE range. The new kit features a number of advances on the previous design introduced in 2009.

Incorporating two layers, the new USAR ensemble focuses on comfort, ergonomic fit and composite flexibility for kit intended for use in a variety of technical rescue tasks as well as road and rail accidents. Both coat and trouser feature a flame retardant outer layer over a waterproof membrane, 3M reflective triple trim and incorporate a pathogen barrier. The product meets the requirements of the EN ISO 11612 General Flame standard and is available in orange, high-viz orange, red and navy and in three alternative outer fabric combinations. A choice of Protex Cotton, Nomex Delta C and Kermel is married up to a Gore Crosstech SR moisture barrier.

Features of this latest Bristol offering include a single zip size allowing any girth variations to be mixed when using the facility to zip the coat and trouser together to form a one-piece garment. Coat flexibility comes in the form of vented underarm panels, underarm gussets, a pleated back, quilted padding on the elbows, improved throat protection and weatherproof seal over the front zip. Added comfort is provided in the form of angled pockets with flaps, full breathability through all layers and wrist straps to close sleeve hems over gloves. Comfort and safety features in the trouser include elasticated side waist, ergonomic curved knee shaping and quilted foam padding with Kevlar for protection and a leg gusset with concealed zip.

For more information, go to www.bristoluniforms.co.uk

Upgraded Website Promises More

AKRON BRASS has upgraded its website to provide customers in over 80 countries with improved functionality, easier navigation and product search capabilities. The redesigned site is now said to make products easier to find and product demonstrations and quote requests from local distributors around the world easier to request. There is a greater focus on engineered solutions and expanded support for solutions in applications such a mining and marine.

For more information, go to www.akronbrass.com

ISG Infrays' Thermal Imagers Available from Pac Fire

Pac Fire Australia has been appointed the exclusive agent for ISG Infrays thermal imaging cameras for Australia and New Zealand. Our new E380 thermal imaging camera has been released and is available through Pac Fire Australia.

ISG Infrays is world-leading designer and manufacturer of firefighting and search and rescue thermal imaging cameras. Each of our innovative products is designed in-house by our own specialist development team. This means that every one of our thermal imagers has been designed specifically for its intended application.

The E380 is the latest thermal imager for firefighting from ISG Infrays, using our new and exclusive Sigma engine technology that enables you to see more scene information than ever before. The Sigma engine drives over 100,000 sensor pixels simultaneously to achieve super-clear imaging performance even in the most extreme firefighting conditions at over 1,000°C. More than 5.5 million scene elements are updated every second, giving you the maximum amount of details available, 100 percent of the time.

This exceptional product houses a number of new features exclusive to ISG Infrays, including the latest Hot Spot Tracker (patent pending) that identifies the hottest object in the scene, tracks it, and displays its relative temperature on the display. This unique new feature is the must-have tool for every thermal imager, enabling you to get more information during size-up exercises, overhaul, and any other situation where hot spot detection is vital to you and your team's safety.

In addition to the Hot Spot Tracker the E380 also houses Direct Temperature Measurement (DTM), the standard X2/X4 digital zoom feature, and Intelligent Focus – (ISG) Infrays best-selling feature of all time. Intelligent Focus gives you the ability to move the thermal imager around your surroundings, and have the Sigma engine technology automatically adjust its settings to give you the clearest imaging performance possible of the scene being imaged. Not only does this enhance your safety, it also allows you to see hidden detail that may otherwise not have been visible in other thermal imagers.

This superior product is housed in our new rugged shell giving you a hard-wearing, long-lasting product that will stand up to the rigorous demands that firefighting entails. Its lightweight, compact design houses a host of automated features and functionality that give you optimal imaging performance without the need for manual intervention or complicated user adjustments.

The E380 also comes with a variety of standard accessories, including spare rechargeable batteries, a retractable lanyard, and new desktop battery charger. In addition, the optional accessories on offer include the latest Fast Attack Charger and the new TAC-Grip accessory. This enables you to further enhance the product's functionality by adding more advanced features, such as a laser assist, video capture and transmitter.

Only ISG Infrays can offer you this easy to use, fully-automated thermal imager with exceptional image clarity unrivalled by any other thermal imaging camera manufacturer in the world, and at an affordable price. We know that a super-clear thermal image can be the difference between a life saved and a life lost, and as a result, our products are among the most sought-after thermal imagers in the world.

We prioritise safety just as you do. It is that simple. APF

For more information, go to
www.pacfire.com.au

Stratos Technology
Knows where to draw the line

Stratos Nano.
Relative sensitivity aspirating smoke detection tailored specifically to smaller, budget-conscious applications.

The Stratos relative sensitivity aspirating smoke detection (ASD) system is a clever box of tricks. Using perceptive artificial intelligence (AI), it learns from the environment and continuously maintains an appropriate level of sensitivity to provide the earliest possible warning of fire without the risk of nuisance alams.

This opens up all sorts of opportunities to deliver the benefits of ASD to a much wider audience. Although it continues to be used extensively in IT and telecommunications clean room environments for which it was originally developed, relative sensitivity ASD means it is also a viable solution for less sensitive, yet critical, applications such as ceiling voids, lift shafts, prison cells and trains. In addition, unlike conventional detectors, ASD systems do not need to be located within the area to be protected, so they are particularly suitable where aesthetic considerations are paramount such as heritage buildings, churches and theatres.

Put simply, Stratos Nano brings all the benefits of ASD to applications where cost would have previously have limited installations to 'fan in a box' point detection.

Relative sensitivity.
Only from Kidde AirSense.

STRATOS MICRA 25

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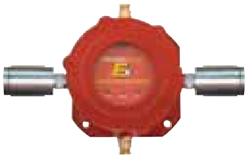
STRATOS HSSD



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A UTC Fire & Security Company

The International Commerce Centre (ICC) is Hong Kong's tallest building

ASD: Relative or Fixed Sensitivity?

Simon Whittall

AirSense Technology

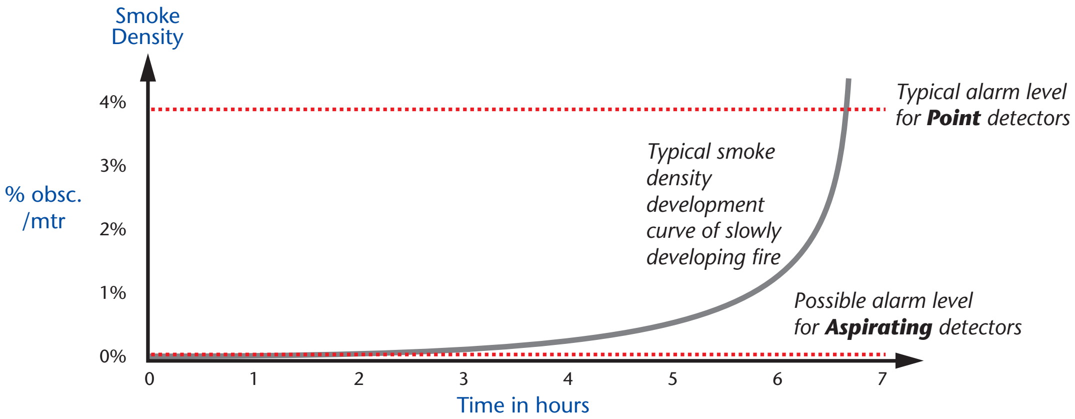
Fire prevention is a fundamental focus in any fire safety engineering scenario. While ensuring provision is in place to respond to and recover from a fire should it occur, preventing it happening in the first place is, quite rightly, the prime objective.

A critical part of the fire prevention process is time. It is perhaps a simplistic statement but one worth making nonetheless, that the quicker a fire can be detected, the sooner action can be taken to extinguish it; the quicker evacuation can, if required, be arranged and the less damage will be caused. This has lead to the widespread adoption of aspirating smoke detection (ASD) systems, which are designed specifically to detect fires in the early incipient stage.

To achieve this early warning, laser-based ASD can be up to a thousand times more sensitive than a point detection system, or other aspirating systems that employ a 'point' type detector in an aspirating enclosure. However, this has lead to concerns that they are potentially too sensitive and, with fire safety engineers and fire services throughout the world looking at how to reduce the incidences of false alarms, this balancing of early detection with minimising false alarms remains a challenge.

It is this challenge that brought about the development of relative sensitivity ASD systems as an alternative to the fixed sensitivity approach. Relative sensitivity is based on a concept whereby the detectors 'learn' from the environment in which they are operating, and continuously maintain an appropriate level of sensitivity. Fluctuations in the environmental smoke density are not uncommon and can be caused by a number of factors, from changes in building occupancy levels and manufacturing processes through to variations in a building's air-conditioning filtration systems. Such variations and fluctuations are relatively minor in terms of the impact on the environment in human terms but, in the context of ASD, which

Figure 1



is based on the detection of microscopic particles of smoke, they certainly are significant.

Fixed sensitivity

In fixed sensitivity ASD systems, the detection device produces an alarm output when the measured smoke density in the protected area reaches a predetermined level (see Figure 1). The detector provides a measure of smoke density, usually by detecting scattered light from a high intensity light source, within an internal detection chamber. The amount of scattered light is approximately proportional to the smoke density, with such systems typically having multiple alarm thresholds located at points along a moving 'bar-graph' output scale. The major drawback with this fixed sensitivity technology is that the bar-graph starts at a measurement of zero percent obscuration per metre; that is, absolutely clean air.

This really occurs only in clean-room environments or specialist laboratories, which is why initially ASD was largely confined to such specific applications. However, as the benefits of early detection have been recognised and a much wider range of other building types and processes have sought to employ the technology – the so called 'real world' environments – the smoke detected by fixed sensitivity detectors must always include a degree of contamination caused by natural processes or shortcomings in the ventilation employed within the protected area. In these 'normal' applications, a fluctuating background of ambient smoke density will inevitably be present that will impact on the performance of fixed sensitivity devices.

When a fixed sensitivity detector activates, it does so because the combined values of ambient smoke and smoke produced by a fire has reached the fixed alarm level (see Figure 2*).* The illustration demonstrates that at two different periods of time (indicated as A and B), the detector will generate an alarm with significantly different density of smoke present (S2 and S2). It also illustrates that, in displaying the sensitivity level at which the detector is supposedly operating, the information has little value because it is displaying the combined smoke densities (alarm value equals S1 plus S2). With no way of knowing what the ambient level will be normally, the fixed sensitivity technology has no way of accurately knowing the density of smoke produced by a fire. Herein lies the great sensitivity paradox – fixed sensitivity detectors in reality produce variable sensitivity/performance to fires.

Relative sensitivity

In a relative sensitivity approach to ASD, as already alluded to, the detector adapts itself to suit the environment in which it is located. Using perceptive artificial intelligence (AI) technology, the alarm thresholds provided are 'relative' to the smoke density of the specific environment being protected, rather than the arbitrary zero point used in fixed sensitivity systems. The relative scaling of the alarm threshold (see Figure 3) means that the increase in smoke required to activate a fire alarm at level S2 is the same, despite the environment having a variable ambient smoke density.

Those who argue against the relative sensitivity approach suggest that a system capable of 'learning' about increases in smoke density will de-sensitise itself to the point where it will not provide early warning – the very reason for selecting ASD in the first place. However, this is not the case. Perceptive AI software 'learns' at a much slower rate than any slow-growth fire scenario. In the event of a fire, smoke density increase in a building is near to exponential, whereas the learning ability of the software is linear; a point recognised by the European Standard EN54-20 that defines fire growth learning limits. Also, the learning process is ongoing and automatic, thereby maintaining the alarm level considerably closer to the 'normal' area smoke density than the fixed

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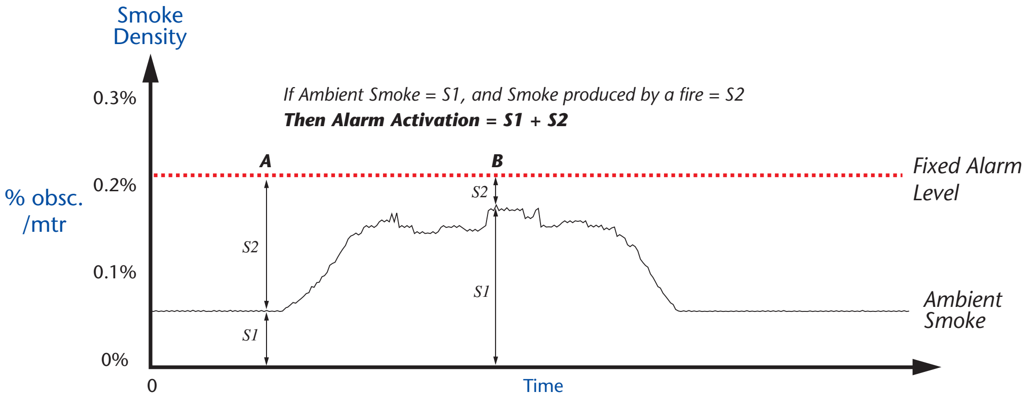
Figure 2



system and therefore potentially providing substantially earlier warning.

ASD systems are now employed in a very wide range of applications, from the telecoms and clean rooms for which they were first developed, right through to heavily industrialised environments. In addition to the advances in relative sensitivity already outlined that have helped make ASD systems more robust, unlike conventional detectors, ASD systems do not need to be located within the area to be protected. The air sampling pipes that draw the air through to the detector can be installed within areas subject to extremes of heat, cold and/or humidity, transporting the air to the ASD detector located outside of the area. ASD is therefore now widely used in cold stores, food preparation areas, textile dying areas and tobacco plants.

ASD in action

The use of ASD in general business environments has also increased significantly, particularly in office blocks characterised by large open atria in the entrance areas. This can cause particular problems for conventional point or beam detectors, as smoke from small fires lacks sufficient thermal buoyancy to reach the detectors and therefore trigger an alarm. This 'smoke stratification' affects buildings with ceiling heights in excess of 12 metres and can render point detectors ineffective, unless the fire has reached the conflagration stage.

A project in Hong Kong demonstrates how a relative sensitivity based system has been used in just such an application. The International Commerce Centre (ICC) is Hong Kong's tallest building. Standing at 118-floors and 484-metres, it is the centrepiece of Union Square at the multi-million-pound MTR Kowloon Station Development. The fourth-tallest building in the world, it boasts a seven-star Ritz hotel at its summit, 232,000 square metres of offices, 93,000 square metres of apartments, and a 93,000 square metre shopping mall at its core.

For this project a report was prepared using fire safety engineering principles to compare a sprinklered approach to one employing ASD. By using ASD, the report concluded that in the ICC, a saving of 2.7 minutes could be made in detection time. By also adopting an information-based warning system, featuring pre-recorded and live messaging rather than a simple tone based system, a further saving of two minutes was estimated in evacuation time. The combination of these two technologies (a time saving in the evacuation process of over 4.5 minutes) and the benefits they brought in enabling occupants to make an orderly evacuation, led to the selection of the ASD-based approach rather than an automatic sprinkler system. The fire engineering consultants on the project responsible for the report was Arup and Dr Mingchun Luo, Director of Consulting at Arup, commented: "The smoke detection system for the office floors can give an earlier warning of fire than a conventional automatic sprinkler system. Consequently, the occupants will be alerted earlier in the event of a fire, saving all important time in the evacuation process."

AirSense's Stratos-HSSD ASD system was selected to protect more than two-thirds of the ICC, including the building's atria – large open volumes with extremely high ceilings. The system overcomes the problem of smoke stratification by allowing strategic positioning of detectors and sampling points. The integrated perceptive artificial intelligence technology eliminates the occurrence of false alarms from the detectors by automatically maintaining multiple-staged alarms if smoke density exceeds statistically determined limits.

The report by Arup also recognised the benefits of ASD in terms of protecting unoccupied areas of the building. While in an occupied room, a fire

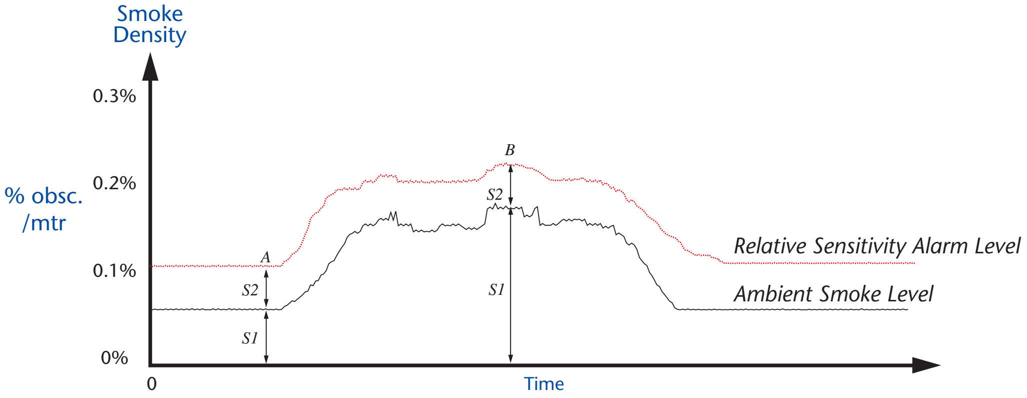


Figure 3

would be expected to be detected by the occupants and dealt with accordingly, the critical case identified in the ICC was to protect against a fire originating in an unoccupied sector.

The risk assessment concluded that, in a sprinklered approach, a fire in an unoccupied office area would be likely to remain undetected for some time. Occupants located in other areas of the building would only become aware once a fire had developed to a significant size, probably at a point when the sprinklers had been activated and so helping to control the fire but where significant amounts of smoke were being generated and damage to the building was already occurring. The early detection provided by ASD was deemed the more appropriate route to take, providing a solution equivalent to, or better than, the level of fire safety achievable through a prescriptive design. This also offered significant cost savings in the overall structural fire safety requirements of the building.

> **While in an occupied room, a fire would be expected to be detected by the occupants and dealt with accordingly, the critical case identified in the ICC was to protect against a fire originating in an unoccupied sector.**

At twice the size of London's Canary Wharf, Union Square is one of the largest developments in the world. Designed as Hong Kong's 'gateway to the world', the project offers unrivalled access to the mainland, is only 20 minutes by rail from Hong Kong International Airport, and features a convenient in-town check-in facility. Union Square is also at the heart of a system of main roads, ferry crossings and rail links. As the project's focal point, the ICC features an observation platform on its 100th floor.

More than detection

Aspirating smoke detection is no longer a new technology. It has been tried and tested in many varied applications. The advent of relative sensitivity based systems brought with it this potential for much wider usage and, although it continues to be widely employed in the IT and telecommunications environments for which it was originally developed, it is now seen in a whole host of situations, from heritage buildings and retail complexes to waste recycling facilities and flour mills. The fact that ASD provides such an early warning at the incipient stages of a fire means that it can effectively be viewed as preventing rather than merely detecting a fire, which brings us back to where we started, namely that fire prevention is the ultimate goal in protecting people, buildings and the environment from the threat of fire. APF

Simon Whittall is Sales Director at AirSense Technology

For further information, go to www.airsensetechnology.com

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Graham Collins

Thermal Imaging Cameras Round-up

In the market for new thermal imaging cameras? In this edition of Asia Pacific Fire we take a close look at the latest models to come onto the market from the leading manufacturers.

The Eagle Has Landed

The new Eagle Attack thermal imaging camera from SCOTT SAFETY is aimed at delivering all the performance, quality and durability that firefighters demand. After asking hundreds of firefighters for their input in the design and development of this product, Scott Safety says that the Eagle Attack offers a full-featured imager in a compact form with no sacrifice on quality.

Its high resolution design provides users with great image quality, reliability, durability and ease-of-use. It is claimed to be one of the lightest and most portable imagers in the industry. Smaller-sized cameras typically sacrifice features and image quality for portability and, while larger imagers are feature-rich, they can be bulky and more difficult to handle in tight situations. The Eagle Attack combines the best of both small and large imagers.

The Eagle Attack has a generous display, a high degree dynamic range, resolution and sensitivity to make fire analysis quick and easy. The high-functioning lens is protected by silicone bumpers and if anything ever happens to the germanium lens, it has been engineered so that change-out can be done in the field. The camera's charging system is fully loaded with simple-to-use features, like daisy chain charging from one power cable to a low profile casing that can be mounted easily on a vehicle, so it can be out of the way but easily accessed.

The camera can be custom configured to suit the user's changing needs and is offered with either a greyscale or colour imagery and the optional Scott thermal video recorder (TVR) that automatically captures every event for training and documentation purposes. It also comes in three rubber bumper colours to suit the customer's own branding.

For more information, go to www.scottsafety.com

Extremely Affordable Vision

Described as "extremely affordable and rugged, enabling every firefighter to be equipped" the HF-Series thermal imaging camera from FLIR produces thermal images of 320pixels by 240 pixels on which the smallest details can be seen. Advanced internal camera software delivers a crisp image without the need for user adjustments.

A 2X digital zoom allows the firefighter to have an even closer look at the situation when necessary. Further described as ergonomic and easy to use, the HF-Series cameras are fully controlled by just five buttons on top of the unit. Weighing just 660 grams – batteries included – the HF-Series cameras are extremely compact and very light. They are reckoned to be ideal for go-anywhere operations, are IP-67 ingress protection rated and operate between minus 20°C and plus 60°C.

For more information, go to www.flir.com

Evolutionary Offering

MSA's Evolution 5800 the newest addition to MSA's 5000 Series of thermal imaging cameras, is being heralded as offering state-of-the-art imagery with a high-resolution-format, microbolometer-based infrared sensor.

New Image Detail Enhancement (IDE) software enhances the camera's imagery so that it matches the total dynamic range of the original image, and makes image detail visible to the firefighter, even in scenes with extreme-temperature dynamics. This enhanced imagery is combined with five user-selectable palettes, to give firefighters a customised image that maximises the scene information needed to plan an attack, even in low temperature contrast environments.

The heart of the new camera is the vanadium oxide microbolometer that incorporates a 320 x 240 focal plane array sensor, generating over 76,000 pixels of image detail with a 36° field of view. 2X Digital zoom magnifies the image detail. Two additional features in all camera models, Standard Quick Temp and Heat Seeker Plus, complete what the company says is the most advanced thermal imaging package available on the market today.

The Evolution 5800 incorporates all of the established user-friendly form factors in MSA's 5000 Series cameras. These include: single-button activation; patented dual-handle design for ease of handoff; a lightweight lithium ion battery with over two hours of run time; a protective battery compartment; and a comprehensive offering of interchangeable accessories. As with all MSA cameras, the Evolution 5800 comes as standard with a two-year camera core warranty and a one-year warranty on all of the other camera components.

The Evolution 5800 comes with a variety of different kits and accessories. They are: a Fire Station kit that contains all of the components and accessories that a fire department needs to put their MSA Evolution thermal imaging camera into service, and a Vehicle kit that contains all of the components and accessories that a fire department needs to install their Evolution camera into service on a fire truck. Other accessories are: a Mini Receiver kit that enables users to customise your own video monitoring and recording setup.; a Deluxe Receiver kit that provides users with a complete solution for viewing transmitted images using a single receiver console.; an Evolution Video Transmitter that allows for maximum flexibility to deploy the transmitter easily when needed; and an Evolution Video Capture kit, a stand-alone video device that records screen action of any Evolution 5000-Series camera for up to two hours.

For more information, go to www.msa.net.au

Up Close and Personal

According to SOLO THERMAL IMAGING, its S2 Personal camera has been designed as: "a high specification, low cost thermal imager to equip firefighters with intuitive thermal imaging technology. Using the UK designed and manufactured Solo TI camera core means less restriction and greater control, as the company manufactures every single part of each S2 Personal. Designed as an ultra-small camera, small enough to easily clip to firefighters' gear, nomex side hand straps complete the rugged external features."

The camera is claimed to be one of the world's smallest, lightest hand-held cameras, weighing only 750 grams including battery, yet still utilises a large format, high-definition display offering sharper, brighter image definition than a standard display. All S2 Personal cameras have the ability to capture and store up to 1000 images in the on-board memory with the press of a button; a capability that is essential for use as evidential proof or during training exercises. Each camera is also provided free-of-charge with Solo TI analysis software that offers greater detail and allows colour mapping to be extracted from the downloaded images.

The S2 Personal shell utilises a fire-retardant polymer material and includes power pack and locking configuration with further protection offered by the oversized nomex side handles and vulcanised rubber screen shroud. It is offered with Solo TI's high resolution/high definition sensor; the same Solo 5200Ti camera core platform as used in the entire Solo TI camera range. This format offers both greyscale and four colour options as standard.

Although the S2 Personal Fire is a low cost unit it comes as standard in an IP67 hard shell carry case. Four rechargeable batteries with charger and all leads; replaceable display window; direct spot temperature and digital read out with temperature scale running along the right hand of the display; battery gauge; four colour maps; Scene Capture with SOLOTI software all as standard features. User preference start-up screen with on screen menu offered in various languages and a choice of shell colours complete the standard issue specification. Optional extras include a neck strap and retractable lanyard; The S2 Personal can also be specified with either one or two button operation.

For more information, go to www.solo-ti.co.uk

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Versatile and Cost-effective

From its introduction and use in military firefighting thirty years ago, the Argus handheld thermal imaging camera from E2V has evolved into what is described as a versatile and cost-effective tool that no modern firefighting force can afford to be without. Thousands of the company's cameras are used by the world's firefighters to save lives and property, including Bangkok Fire Department and Hong Kong Fire Department, both of which use Argus 4 cameras.

Argus cameras are designed using advanced digital imaging technology for what is said to be the ultimate in sharp picture quality with the best image quality of any handheld thermal imaging camera on the market today. The new Argus4 320 – an upgrade to the highly successful standard Argus4 – provides firefighters with high-resolution thermal imaging at the same purchase price as many low resolution options.

Argus cameras offer two types of temperature detection to aid firefighters in determining the heat of their surroundings. Ambient temperature measurement gives firefighters rapid identification of the area's temperature within the fire environment. Notification of these temperatures can indicate dangerous situations and the firefighter can make a decision whether to evacuate the premises or continue the search. Spot temperature measurement enables firefighters to pinpoint the exact heat of objects or obstacles. This saves time and extinguishant by allowing firefighters to focus on the hottest part. This option enables fast and effective location of the seat of a fire or detecting hot spots in cavity walls or behind doors, which indicates potential danger in another room. Additionally, this feature can be useful for determining the temperature within enclosed capsules or spaces, even measuring the temperature of gas cylinders. Temperature sensitivity modes are now used to expand the dynamic temperature range of the thermal imaging cameras. Argus cameras have three modes to further increases the viewable temperature range up to 1010°C. The image on a camera LCD screen can move seamlessly from a cooler scene to a very high temperature scene without the loss of detail "whiteout". It also means that a body located in very high temperatures can still be seen by the cameras handler.

For more information, go to www.argusdirect.com

Compact and Ergonomic design

The latest thermal imager from BULLARD is the Eclipse, described as "a low-cost, lightweight, personal-issue thermal imager designed for every firefighter". This ultra-small thermal imager is ergonomically shaped to fit in the palm of a firefighter's hand and lightweight enough to attach to turnout gear. Weighing 680 grams, the Eclipse is being promoted as offering the fire service an opportunity to bring thermal imaging to more firefighters.

Introduced in 2009, the Eclipse has gone on to become one of Bullard's most popular thermal imagers. In addition to a standard 80 x 60 engine, it is also available with a 160 x 120 high resolution engine that enhances the versatility of the camera by providing firefighters with clearer, crisper and more detailed images, making it suitable for use as an analytical and navigational tool.

The Eclipse can be equipped with optional advanced features, including Bullard's electronic thermal throttle that aids firefighters in revealing hidden fire and distinguishing hotter objects, saving firefighters critical time and preventing costly mistakes. Other optional features include high-heat colorisation, temperature measurement and customised start-up graphics.

For more information, go to www.bullard.com

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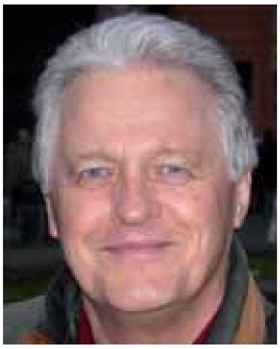

New Water Enhancer Hots-up the Agent Debate

By Graham Collins

A water enhancer developed in the USA has just become available in the Asia Pacific region and the manufacturer claims that it will replace Class-A foam systems and Compressed Air Foam Systems.

TetraKO is a corn-starch-based, biodegradable water enhancer – an additive that changes, or transforms, the composition of water in a firefighting appliance or apparatus – that the manufacturer, EarthClean, claims turns ordinary water into a technology that can knocking-down a fire faster and more effectively than water, Class-A foam, or Compressed Air Foam (CAF).

When the product is applied, it has what is described as "stick and stay" ability, adhering to vertical surfaces and smothering the fire; it does not run off a surface like water or foam. Because it "sticks and stays", it takes the fuel out of the fire to provide dramatically enhanced performance. In addition, the corn-starch provides a much greater level of heat calorie absorption in the upper thermal layer of a fire. Another benefit of TetraKO is that it dramatically reduces rekindling. Even though it looks like a thick liquid, it is actually pumpable through regular hoses, nozzles and anything else that can pump or spray water.

Because the product adheres to all surfaces, exposure protection on structures is yet another benefit. A fire department recently used the water enhancer to protect a home and adjacent automobile garage from the radiant heat generated by a nearby structure fire in a congested neighbourhood, and at a fire test centre in Minnesota, TetraKO was successfully used to protect walls that were less than a metre away from fully engulfed test pods at 1200°C.

TetraKO is said to be different from other water enhancers and gel technologies. These other products utilise Super Absorbent Polymers (SAPs) that absorb many times their weight in water, do not have sheer thinning abilities for pumping, and cannot be pumped through standard fire equipment. TetraKO uses zero SAPs, and instead features dual-thickening agents that provide sheer thinning ability, similar to the technology that is found in bottles of hand sanitizers. Sheer thinning technology converts it from a gel to the same viscosity as water when pumped under pressure and then reverts back to a gel once it leaves the nozzle. Hence, its ability to be pumped through standard fire equipment. Once TetraKO hits about 150°C it becomes twice as thick and sticky, and provides much greater absorption of the heat. This is directly due to the corn-starch.

As a powdered product, the shelf life is at least two years. When the product is mixed in a fire appliance, it will stay in good condition for an average of 30 days, depending on environmental conditions.

Game Changing Technology

TetraKO is described by EarthClean as "game changing technology that has the potential to

One five to ten second burst of TetraKO completely knocked-down this car fire

become a vital tool in the firefighting arsenal of municipal and wildland firefighting operations", working alongside water and engineered to replace Class-A foam systems and Compressed Air Foam Systems.

EarthClean points to a study by UL prepared for the U.S. Fire Administration in September of 2008 that concludes that Class-A foam is no more effective than plain water. The last paragraph of the Executive Summary states, with respect to Class-A foam, that, "neither the time to reduce the heat release rate to 17 percent of the initial heat rate, nor the regrowth heat release rate after suppression termination were considered to be significantly different when comparing water only to the agents and concentrations tested."

Quick Knockdown, Longer Lasting Suppression, and Reduced Rekindling

At recent testing at the SCALE (Scott County Association for Leadership and Efficiency) fire training facility in Minnesota, several pods filled with hay and wood pallets were burned. The time to initial knockdown, as well as time to rekindle was measured and, compared with water and Class-A foam, TetraKO – on average – reduced the temperature in the upper thermal layer by 58 percent in 15 seconds compared with water at 28 percent and Class-A foam at 25 percent.

These tests were conducted using Thermoworks temperature probes rated at 1,200°C. The heat data is collected in one-second intervals and recorded in a data collection device that maps and graphs the knockdowns, heat calorie absorption, and time to rekindle. A comprehensive series of tests were recently completed at Texas A & M, and the world-renowned Texas Engineering Extension Service (TEEX), where TetraKO was tested side-by-side against plain water and Class-A foam. In attendance at these tests were members of the International Association of Fire Chiefs (IAFC) Technology Council as well as members of its Wildland Fire Policy Committee.

Mixing Process and Water Usage

It is a batch mixed product whereby a universal system efficiently injects the powder into the booster tank while the apparatus is recirculating, creating a homogenized blend. It can also be mixed into a foldable water tank or handheld backpack sprayer.

In various live fires and test burn scenarios TetraKO has proven to use far less water to knockdown and extinguish a fire. Due to the "stick and stay" technology, there is virtually no water run-off, reducing by many times the total water used in typical firefighting. On a structural fire, the overhaul process is reduced and, therefore, the amount of water damage is reduced.

To clean tanks and hoses, fire departments simply rinse them with plain water after use. TetraKO does not require any special equipment and there is no residue. At a fire scene, the product is biodegradable and will not harm vegetation or the watershed, so there is no concern about its environmental impact.

Certified Biodegradable

The product has been independently tested by four accredited and independent laboratories. TetraKO met the required EPA (Environmental Protection Agency) Office of Prevention, Pesticides, and Toxic Substances (OPPTS) standards and was verified to be 'ready biodegradable', the highest level of biodegradability possible. It was also independently tested for aquatic and mammalian toxicity and was found to be non-toxic. It has been tested to the required NFPA 18A standards for Uniform Corrosion and has been found to be non-corrosive. EarthClean is in the process of applying for the U.S. Department of Forest Service requirements for wildland application.

Main applications

TetraKO is engineered for use in both urban and rural structural firefighting, as well as wildland and urban-wildland interface firefighting. Extensive testing has been carried out in EarthClean's laboratory and on the company's own fire truck. Several fire departments have been using the product, primarily in Waterous pumps, for over a year, and the company says it is in contact with key OEM pump manufacturers to accelerate the product's development and acceptance.

TetraKO's ability to lay down a wet-line of fire protection is very significant for wildland firefighting. In April of 2011 in Possum Kingdom, Texas, a firefighter laid down a three-metre wide wet-line to protect a neighbourhood from a wind-driven wildfire with 12-metre high flames. The fire burned 600 millimetres into the wet-line and was stopped in its tracks. In addition, the manufacturers of TetraKO believe it is the first technology that is effective for a direct attack and knocking the head right out of a wildfire. The technology will not rehydrate, which is very important as gels that rehydrate will actually absorb moisture from plant life and ultimately kill what they are designed to protect. Once TetraKO evaporates, it dissipates into the environment because it is biodegradable.

Over the past year numerous drop tests have been conducted with the Fire Boss Air Tractor, delivering what EarthClean describes as "amazing results" with the coverage provided by the TetraKO.

The product is currently being assessed and approved in Korea, where an exclusive distribution agreement has been signed with SAM JOO Ltd, a clean technology company. TetraKO is also being assessed and approved in Japan. APF

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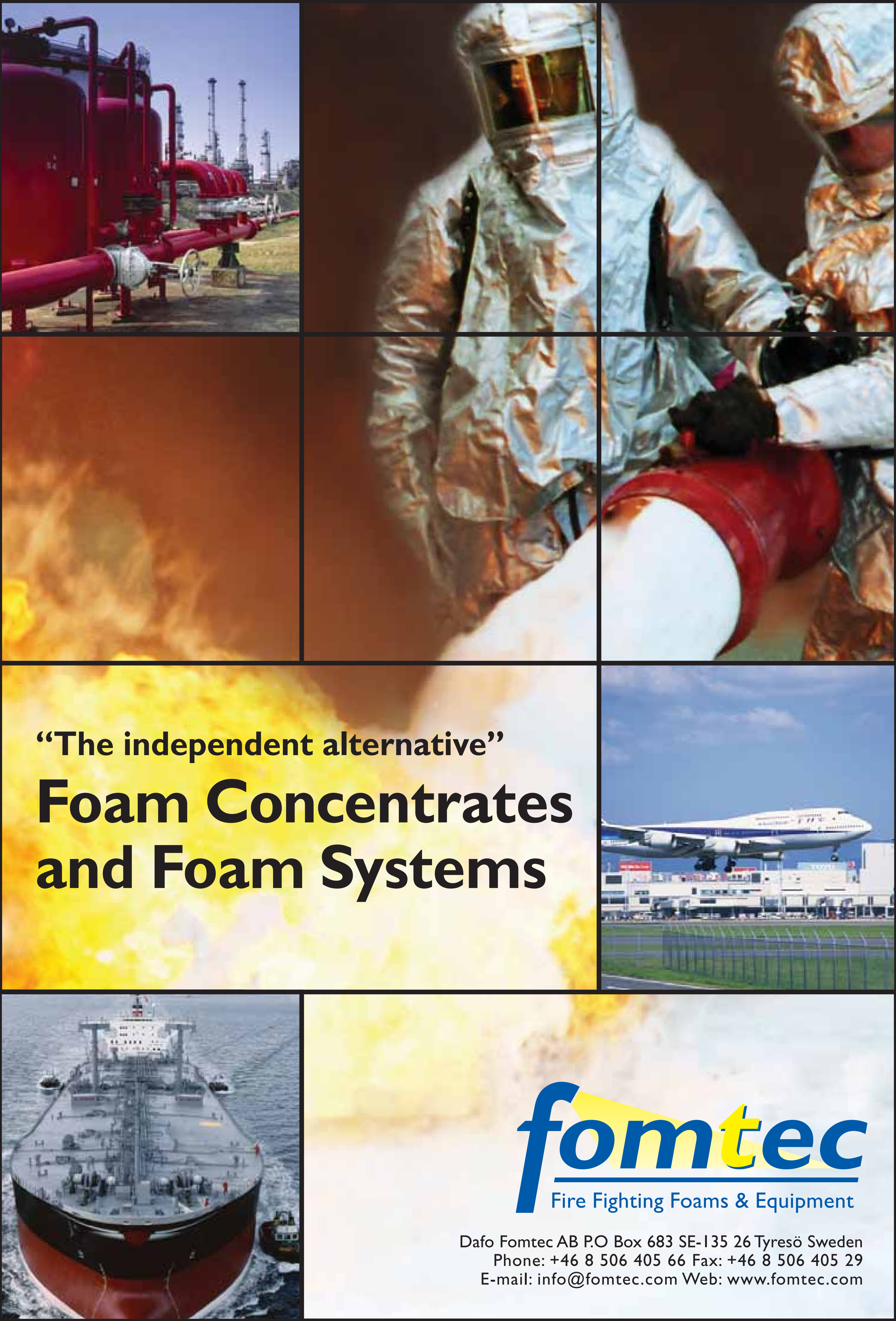

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The Trelleborg solution during a full scale test

Safely Does It

Jan-Hugo Nilssen

Trelleborg Offshore

With safety a key priority for the offshore oil and gas industry, ensuring safety on-board any production facility is absolutely vital. Critical to delivering on-board safety is the fire deluge system, however, traditional carbon steel-fabricated deluge systems are prone to corrosion when carrying saltwater, which can restrict or even block flow as rust forms.

Active fire protection systems, such as the fire deluge system, are essential for on-board safety and are designed to activate either mechanically or electronically in order to extinguish fires. As the risk of rapid fire spread is greater than most in the offshore and onshore oil and gas industry, the fire deluge system needs to provide full assurance to the on-board team that it will not fail to deliver on any critical firewater or utility piping installations.

Traditionally carbon steel-fabricated deluge systems have been installed to ensure on-board safety. However, these are prone to corrosion that can cause vital systems to fail. The result is that the industry has suffered from costly shutdowns and repairs, and in the worst case scenario, risk of failure in an emergency.

In addition, traditional systems also require constant maintenance, cleaning and testing, resulting in additional unnecessary and costly downtime for the facility.

Next Generation Technology

This has spurred the development of a new generation of fire-deluge systems that use synthetic rubber instead of traditional materials such as rigid steel, titanium, copper nickel and glass fibre piping.

By utilising synthetic rubber, leading manufacturers have been able to create a system that is non-corroding and can withstand jet fires with a heat flux of 390kW/m^2, temperatures above 1250°C and flame speeds that exceed the speed of sound. This makes it ideal in deluge and sprinkler systems on offshore oil and gas installations and ships, as well as other hazardous environments.

This new technology can be used to either partly or completely replace old systems and is also an ideal solution for temporary deluge systems when high safety levels need to be maintained during modification work to existing systems. The flexibility of the system allows it to be moved and reused (if temporary). Compared with rigid pipe systems, it requires fewer construction drawings and the need for accurate measurements is reduced as the system can be designed and modified on site.

Proven Solution

A recent example of how a traditional carbon steel-fabricated deluge system failed and was successfully replaced by a new, synthetic rubber alternative, can be seen on Maersk's FPSO Ngujima-Yin, a floating production storage and offloading (FPSO) vessel located in the Vincent Field off Western Australia. The vessel commenced operation in 2008 and has a daily production capacity of 120,000 barrels of oil and 100 million standard cubic feet of gas.

The existing carbon steel seawater deluge system became corroded only two years after installation and required a significant number of man hours to carry out regular maintenance, cleaning and testing. A replacement was therefore required to reduce the long-term cost of ensuring essential fire protection at all times. The challenge with the installation was to replace the existing fire deluge system throughout the FPSO modules, without affecting the safety of the vessel as it continued output. The system required approximately 1,600 metres of pipework, from 25mm to 200mm diameters, and associated fittings and accessories.

System Considerations

Several factors had to be considered prior to specifying a replacement system. As the FPSO is a live production vessel, it must operate within a stringent set of safety regulations, requiring complete deluge coverage at all times. A temporary system would therefore have to be rigged up while the existing pipes were removed and installation of the new system was undertaken.

Replacing a conventional deluge system requires hot work such as, welding, cutting, brazing, soldering, and grinding, which poses a number of issues when carried out on a live hydrocarbon facility. Any activity that generates heat, sparks, flames or other potential sources of ignition in an atmosphere that may be flammable, requires a hot work permit. This is only granted after an in-depth risk assessment and also requires on-going monitoring. To secure a permit, it may be necessary to isolate part of the hydrocarbon systems on a vessel, shut down production modules or use special habitat equipment. As such, hot work is usually carried out only as a last resort.

A number of material options were considered, including rigid copper-nickel and flexible synthetic rubber. Copper nickel has an extensive field-proven record and is cheap to purchase. However, it requires significant pre-fabrication and on-board construction. In contrast, synthetic rubber is easier to install and can be bent to a radius equal to five times its diameter, meaning it can negotiate minor clashes and obstructions as the installation progresses, while maintaining its structural integrity.

Compared with rigid pipe systems, fewer detailed isometric construction drawings are required with a synthetic rubber system and the need for accurate measurements is reduced as it can be designed and modified on site. This means a flexible synthetic rubber FPSO module deluge system can be installed in less than three months, while the installation time for an equivalent typical rigid system would be significantly longer.

Taking these factors into account, Maersk contracted Trelleborg Offshore to install its synthetic rubber Elastopipe corrosion-free fire safety deluge system on the FPSO.

Corrosion-free Protection

The Trelleborg Offshore system was developed as a result of both customer and industry feedback. Its design incorporates three core layers: the fire shield, pressure liner and inner layer. These combine to give the system high tolerance to impact, jet fire (1400°C for one hour), explosion and water hammer. The system is light weight, durable, easy to cut, fit and install.

Compared with a conventional carbon steel-based deluge system, which will require more frequent testing and maintenance and need replacing at regular intervals over the lifetime of the platform or vessel, rubber deluge systems deliver a very low total life cost. The flexible piping system offers a 30-year minimum maintenance life and its corrosion-free performance means system testing frequency can be reduced to statutory requirements.

Installation

The regulatory bodies governing deluge systems for FPSOs and similar structures did not have specific regulations to cover the flexible piping system, so there were early enquiries from independent verification societies into its concept and feasibility. For the project to proceed, approval from a number of national and industry authorities needed to be obtained. As the Maersk Ngujima-Yin is a Danish registered FPSO, the Danish Maritime Organisation (DMO) had to approve the use of the flexible piping system on-board the vessel.

National Offshore Petroleum Safety Authority (NOPSA) approval was also required as the FPSO was producing oil in Australian waters. Finally, the installation had to be approved by Lloyd's Register, which classed the ship. All authorities involved approved the solution proposed.

The materials for the first module and the temporary deluge system were air freighted to Australia and were on-board the vessel within a week. The system, which comprises approximately 1600 metres of flexible piping, titanium fittings, nozzles, pipe supports, valves and strainers, was pre-fabricated on board the Maersk Ngujima-Yin. This included cutting pipe runs to the required length and fitting the necessary ancillary components.

The first installation on the M60 module required 278 metres of flexible pipe and was completed in less than two weeks. The synthetic rubber-based flexible piping system was installed without any welding or other hot work, such as high speed cutting, which could compromise the safety of the vessel. The rubber was cut using a specialist hand-held pipe cutter, while joints were made mechanically using air-operated hand tools and proprietary clips. Without the risk of sparks or naked flames, production and processing could continue unaffected.

A temporary Elastopipe deluge system for each module was installed before the existing steel pipes were removed and the permanent flexible pipe work and fixings were completed. This method ensured that full fire protection was retained throughout the project.

The fast-track project was carried out by ten expert rope-access pipe fitters and two supervisors. No lost time incidents (LTIs) were reported during installation. The installation team worked independently, without disturbing activity on-board or impacting production. The team implemented the full scope of activity in full compliance with both Woodside's golden safety rules and Maersk's divisional management system that includes the Maersk permit to work system.

The flexibility and light weight of the deluge system allowed very rapid installation, compared with a rigid pipe system, as it could be swiftly configured to confined spaces. The first two modules were completed in just a month and all seven modules were completed and full scale tested within three months, with no disruption to oil and gas production.

Providing Peace of Mind

Safety on offshore oil and gas installations is of paramount importance and having an effective and reliable deluge system is vital to ensuring on-board safety.

With corrosion a real risk, steel-based systems require regular maintenance and replacement that is not only disruptive but also costly. In contrast, with proven advantages over metal and polymer rigid pipework, next generation systems that utilise synthetic rubber, offer a 30-year minimum maintenance life for fire deluge and sprinkler systems as well as real lifetime cost savings. Due to their corrosion-free performance, system testing frequency can be reduced with confidence while maintaining full 24/7 availability, giving peace of mind to all those on board. APF

Jan-Hugo Nilssen is Sales Manager at Trelleborg Offshore

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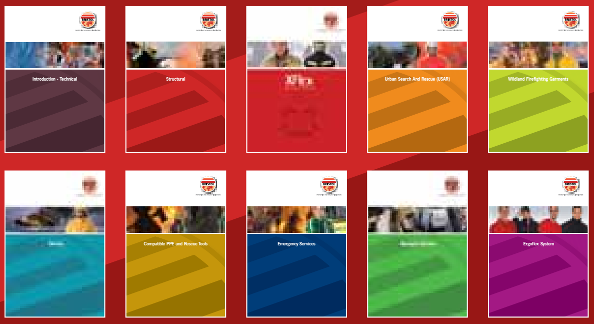

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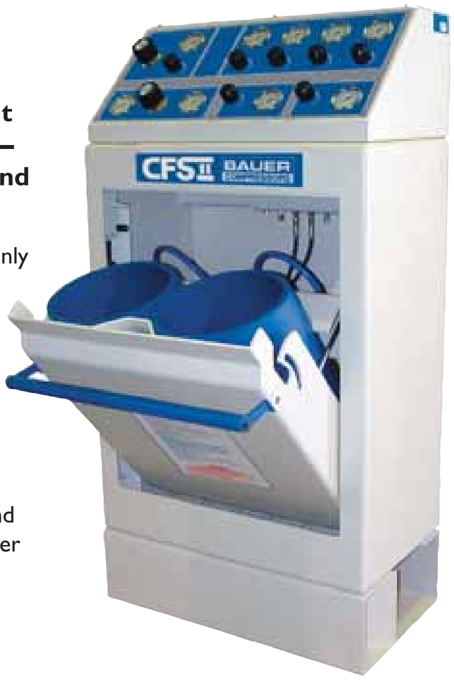

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Firefighter Protection

– Striking the Right Balance

The current hot topic for debate among fire and rescue services, fibre, fabric and PPE manufacturers and standards bodies is to what extent wearer comfort should be a trade-off against safety. But are we right in thinking that the two are in any way mutually exclusive? In fact, there is a strong case for arguing that for the firefighters, who are, after all, the prime consideration in this debate, there are four key elements that we should be taking into account when considering their overall health and safety.

Paul Gibson

Bristol Uniforms

In what could be termed a PACT between the firefighter and his or her employer, these four elements are Protection, Agility, Comfort and Trust. It will be a combination of these four attributes associated with their PPE that will provide the firefighter with the highest possible level of wearer confidence and which, at the same time, will be the measure of a responsible and caring employer.

But, how do we define these four key elements in such a way as to ensure that the full benefits of the PACT between employer and employee are realised?

Protection is what is uppermost in our minds when we look at PPE – it goes to the heart of all personal protective equipment. It is measured independently against national, regional or international standards, devised and agreed by experts in their field and empirically tested through the use of robust test procedures on a wide range of PPE. Here, we are particularly concerned with the protection offered by firefighter clothing. By using the best available fibres woven into class-leading fabrics, manufacturers are able to bring the protective qualities of each into multi-layered combinations that provided the prime protective qualities required by the wearer in any given hazardous situation.

Agility and comfort do have some aspects in common but, as far as the wearer is concerned, are different features. Agility focuses on the desirability of having firefighters capable of being able to move easily and swiftly away from danger when working on the fireground, which requires clothing to be flexible and light enough to effectively carry out rapid escapes, where necessary. Comfort, on the other hand, is achieved by providing coats and trousers that fit well, are shaped effectively to body contours, equally well for males and females, and the wearing of which provides the minimum of fatigue when worn for long periods.

Trust is the last element of the four and relates to the physical and performance integrity of the clothing. By providing an integrated

managed service, manufacturers can ensure that the performance characteristics, present in any PPE when it is new, remain intact throughout the service life of the garments. Through regular inspection, repair, washing and decontamination, the protective qualities of individual items of clothing can be assured, which will instil a level of trust among firefighters in both their garments and their employers who will be seen to have the safety of their employees as a high priority.

Bristol's PACT with firefighters who wear their PPE has developed over recent years from the introduction of the Ergotech designs some ten years ago, along with their lifetime managed services, to the most recent introduction of the innovative XFlex designs. The basic principle, which takes comfort and flexibility to a new level, through the advanced design offering improved articulation at key body flex points combined with a range of Hainsworth ECO-dry thermal liner options, is now incorporated into a range of PPE including structural firefighting clothing as well as new USAR kit and incident ground kit for the nation's ambulance HARTs.

Internationally, the comfort and high performance features provided by Bristol's Ergotech Action design were key factors in the decision of Australia's Air Services ARFF to re-equip its 650 firefighters, stationed at 21 of the country's busiest airports, with Bristol's PPE, which was deployed in early 2010. PAC Fire, Bristol's Australian distributor, worked closely with Bristol to submit a tender based on the lightweight ErgoTech Action design incorporating a Pbi Gold outer-layer with Goretex Airlock thermal and moisture barrier. A number of changes were introduced to the garment's features to make them ideal for Australian conditions, which enabled the two companies to secure the contract. The initial 1400 sets of fire coats and trousers were chosen on a combination of factors including the overall performance of the Bristol garments, their certification to Australian standard AS4967 and the high total-heat-loss readings all of which met the high specification set by ARFF.

In addition to the supply of the PPE, a fully certified maintenance service will also be provided. PAC Fire has contracted a partner company, fully certified by Bristol, to carry out repairs and decontamination. All ARFF structural garments are fitted with an RFID computer chip that allows ARFF, PAC Fire and the contractor to monitor and condition-code every garment throughout its service life.

Keith Ward, PAC Fire's managing director said at the time the new kit was brought into service: "ARFF is now one of the best PPE equipped fire brigades in Australia and should be congratulated on its efforts to improve the level of personal protection for its aviation firefighters deployed across the country. ARFF now has a leading-edge technical garment that will serve it well for many years".

Ivan Rich, Bristol's Technical Manager and Project Leader for the planned new European Standard for firefighter technical rescue PPE, commented: "Following requests made by several countries in Europe, a new work item has been agreed to develop a new European standard to cover technical rescue and other firefighter activities excluding structural fire fighting. It is recognised that in many cases firefighters have been over protected while carrying out their duties. Overprotection has led to discomfort and fatigue, which has given the wearer a new hazard to consider."

Dave Matthews, who chairs and leads on all BSI, CEN and ISO Protective Clothing Committees impacting firefighters, commented: "In the European Union (CEN) and International (ISO) Standards Committees responsible for firefighters PPE, comfort, thermal protection, compatibility and physiological aspects are now uppermost in standards writers' minds. How we best address these matters is always going to be a compromise of thermal protection versus comfort. The quality PPE manufacturers are continually striving for innovative solutions and comfort and physiology are now testing their R & D. prEN 469, which successfully passed its First Enquiry ballot by 17 votes to two, will now see a Physiological Annex inserted as an Annex. This was prepared by myself and Leeds University. Under my CEN committee for Heat and Flame Protective Clothing TC 162 WG2, I have appointed a Project Group led by Dave Frodsham of W. L. Gore to assess the problem and make recommendations on the Annex. I fully expect improvements to be made during the next CEN ballot stage".

He added, "I would wish to remind PPE manufacturers that, in fact, firefighters are human beings and dressing them in relatively heavy PPE and sending them into a very hot humid environment leads to sweating, a natural method of the body to attempt to cool itself. We will only ever go so far, and this is the balance we strive to achieve". APF

Paul Gibson is International Sales Manager at Bristol Uniforms

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Filming approach and shut down procedures on a hybrid. Pic courtesy of B. Crittenden and Action Training Systems

Get Extrication Training Up to Speed with New Vehicle Technology

Pat West

Action Training Systems

Surging sales of hybrid and electric vehicles point to a pressing need for updated training to prepare rescuers to respond to crashes involving these types of vehicles. To meet the challenges on today's roads, rescuers also need knowledge of advanced steel used in auto manufacturing and techniques for extricating patients using only hand tools.

Global sales of hybrid vehicles topped 4.5 million as of December 2011 with Toyota Motor Company leading the pack. Hybrid cars are now available in 80 countries and regions. Consumer demand for "green" vehicles is also propelling fast-growing sales of vehicles with all-electric propulsion systems, such as the Nissan Leaf, and "extended-range" electric vehicles carrying a small fuel tank, such as the Chevy Volt. New government standards in many countries requiring greater fuel efficiency and reduced emissions in vehicles will force the auto industry forward in hybrid and electric technology for the foreseeable future.

All late-model vehicles now carry hardened steel materials that may defy older-generation hydraulic cutters. Teams that are not prepared to cut or work around advanced steel may not be able to extricate injured patients in time to save their lives.

"The challenges presented to rescue responders by petrol-electric hybrid vehicles is increasing as a larger number of these vehicles are encountered on the streets," says Ron Moore, retired battalion chief and training director for the McKinney Fire Department in Texas, USA and author of two books on vehicle extrication. In addition to his writing, Moore is known for delivering hands-on extrication training. He is also a strong proponent of multimedia computer-based training in vehicle extrication because the opportunities for hands-on

The Hi-Lift First Responder jack. Pic courtesy of B. Crittenden and Action Training Systems

training with new model vehicles are all-too rare.

"Although hands-on skills training is the backbone of vehicle rescue training for proficiency, our ability to train on new model vehicles with unique features is limited," asserts Moore. "This is where multimedia training comes in. Through this kind of training methodology, responders can become familiar with new technologies and train until comfortable encountering a crash-damaged vehicle or a unique challenge that they have not had experience in handling in the real world."

For the past year, Moore has been working with Action Training Systems, Inc., a US-based publisher of international multimedia training materials for first responders, to help generate new instructional materials on hybrid and electric vehicles and other topics in vehicle extrication. In 2012, Action Training Systems will update its vehicle extrication series, originally published in 2006, with input from Moore and three other technical consultants: Randy Schmitz, a Calgary, Canada vehicle extrication specialist and International Association of Fire Fighters (IAFF) Calgary firefighter; Jeff Pugh, a founding member and lead instructor for the Puyallup Extrication Team based in Puyallup, Washington, USA; and Matt Stroud, a former master technician for Toyota and instructor for MGS Tech in Seattle, Washington.

Action Training Systems' vehicle extrication training materials will be expanded with three new programs: Hybrid and Electric Vehicles, Advanced Steel, and Hand-Tools Only. The original seven programs in the series – Incident Overview, Stabilisation, Hazard Control and Safety, Initial Procedures, Door and Sidewall Procedures, Roof and Trunk Procedures, and Interior Procedures – are also being updated. All programs will be available on DVD, CBT (computer-based training), and PowerPoint formats for use in classroom training and independent student study.

Hybrid and Electric Vehicles

"Hybrid cars, SUVs, vans, and now even trucks and buses are a reality," points out Moore. "There are definitely certain steps to take to properly manage the situation and there are several actions that responders should not take at a hybrid vehicle incident. For example, touching any exposed electrical components or wires on a crash-damaged hybrid or electric vehicle before the vehicle's power system is shut down could cause severe burns or electrocution."

Hybrid and electric passenger vehicles normally have two electrical systems: the familiar 12-volt battery system that provides low-voltage power, and a high-voltage system to propel electric motors. The heart of the high-voltage system is a NiMH or lithium-ion battery pack typically storing 240 volts to 650 volts. Vehicle manufacturers design many redundant safety features to isolate the high voltage to the battery in a crash, but rescuers should not assume safety features will function as designed in damaged vehicles.

The new Action Training Systems' Hybrid and Electric Vehicles program provides an overview of the propulsion systems used in hybrid, electric and extended-range "plug-in" vehicles and shows students common components and systems. Firefighters demonstrate a standard seven-step procedure for approach and power shutdown that can be used at any accident scene.

Incorporating hybrid and electric vehicles into daily response procedures is important because responders initially may not realise the vehicle they are responding to is a hybrid or electric vehicle. Badges on the body might not be evident on a crash-damaged vehicle and some manufacturers are making hybrid versions of what were previously conventionally fuelled models. The program also shows common alternative shutdown procedures for situations when the ignition or keys cannot be accessed to power down the vehicle's high-voltage system before beginning extrication operations.

The U.S. National Highway Traffic Safety Administration issued new guidelines in January 2012 to update rescuers' response procedures for crashes

"Tenting the roof" using the Hi-Lift First Responder jack. Pic courtesy of B. Crittenden and Action Training Systems

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Accessing the trunk of a hybrid. Pic courtesy of B. Crittenden and Action Training Systems

involving electric and hybrid vehicles. NHTSA's "interim guidelines" focus on mitigating hazards for crashes in which the high-voltage battery system is compromised or involved in fire. NHTSA issued the guidelines following its investigation into the causes of a fire involving a Chevy Volt at a NHTSA research facility. The agency determined that the Volt's lithium-ion battery system ignited several days after it was damaged in crash-testing. Although there have been no reports of fires of the Chevy Volt or any other electric vehicle following real-world crashes, according to NHTSA, high-voltage batteries (particularly the lithium-ion type) damaged in a crash do present the hazard of "immediate or delayed release of toxic and/or flammable gases and fire."

The new Hybrid and Electric Vehicles program will incorporate NHTSA's warning signs of a high-voltage battery fire (leaking fluids, gurgling noises, sparks, unusual odours and bubbling sounds coming from the high-voltage battery compartment) as well as appropriate response procedures.

"Through this update to the extrication series, rescue personnel are provided with the most current, state-of-the-art information available," says Moore. "The program explains what these new vehicles are, how they are similar or differ from our experience and how to safely and efficiently manage these vehicles in fires or collisions."

Advanced Steel

Advanced steel is another topical subject for vehicle extrication teams in a new program in the vehicle extrication series. This new category of ultra-high strength steels (UHSS), such as Boron and Martensite, are now commonly used in vehicle manufacturing to protect passengers in a crash. Advanced steel can be up to ten times stronger than the mild steel rescuers routinely cut through with any hydraulic cutter. UHSS steels require new-generation hydraulic cutting tools and special techniques.

The Advanced Steel program presents an overview of types of steel used in auto manufacturing and where rescuers will encounter the material in newer vehicles. Firefighters demonstrate techniques for cutting advanced steel with hydraulic cutters – both older hydraulic cutters and new cutter technology –and "work-around" techniques that crews can use to complete a successful extrication even if advanced-steel-capable cutters are not available.

Hand-tools Only

Hydraulic tools are a vital component of an extrication team's equipment cache. Nevertheless, training to extricate patients without them is an important concept for vehicle extrication teams to embrace.

Calgary's extrication specialist Randy Schmitz says rescuers should not become over-reliant on their hydraulic tools. "If your hydraulic pump fails, the cutter blades break, or if the tips of your spreader arms fracture, you are 'dead in the water' without a back-up plan such as hand tools." Schmitz has served as a judge in recent Transportation Emergency Rescue Committee (TERC) international extrication competitions, which include hand-tools only events.

Even if hydraulics are available, they may not be the best tool for the job. Puyallup Extrication Team's Jeff Pugh provided input for Hi-Lift Jack Company to design the First Responder Jack, a new version of the jack designed specifically for the needs of rescue operations. Among the new features of the jack is a base that is larger than that of a standard Hi-Lift jack, providing increased stability for lifting, winching, pushing and pulling. In certain situations, the manual jack is superior to hydraulics, Pugh claims.

Pugh is also a lieutenant with Central Pierce Fire & Rescue in Washington State where he recently responded to just such a situation during a storm. "We had a vehicle in a ravine in a precarious situation involving water," recalls Pugh. "Just getting hydraulics down into the ravine would have been labour intensive. In this case, we were able to get the First Responder Jack to the scene immediately to extricate those people."

In today's economy, budgets for fire-rescue organizations have never been tighter. Low-cost, reliable hand tools may be the only option for some rescue teams.

The Basics

Knowledge of the fundamentals in vehicle extrication is just as important to rescue teams as keeping pace with new technologies and materials in auto manufacturing. Every rescuer should know the basics in how to size-up the scene, incident management, stabilisation and as many ways as possible to access the patient by removing windows, doors, the roof, impinging objects in the interior, and through trunk tunnelling. These evolutions are demonstrated in the original seven Vehicle Extrication series titles.

When patients are injured and trapped inside of a vehicle, rescue crews are under tremendous pressure to get the patient out of the vehicle to medical care, especially if the patient is not stable. If they do not have the required training to get the victim out, the results can be devastating. APF

Pat West is Content Developer at Action Training Systems

For further information, go to www.action-training.com

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DST-3P4	5.5	14885	18", 4-Blade	81 lbs.	23" X 23" X 21.5"
DDST-3P4	5.5	14885	18", 4-Blade	82 lbs.	23" X 23" X 21.5"
DST-3P4-L*	5.5	14885	18", 4-Blade	85 lbs.	23" X 23" X 21.5"
DST-3P4-6.5	6.5	17000	18", 4-Blade	91 lbs.	23" X 23" X 21.5"
DST-9P4	9	17500	20", 4-Blade	115 lbs.	26" X 23" X 21"
DST-13	13	22000	24", 4-Blade	136 lbs.	30" X 28" X 24"

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E18P4	5	22000	18", 4-Blade	88 lbs.	23" X 23" X 16"
EB18SP	1.25	12000	18", 2-Blade	90 lbs.	21" X 21" X 19"
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Michael C. Ruthy

W.S. Darley & Co

In a perfect world, Plan A works, and the sprinkler system puts out the fire. Before I am accused of blowing this out of proportion, this does work in the vast majority of emergencies. But sometimes it does not, especially in construction projects where such systems may not be fully operational, and the Shanghai Fire Department wanted to be prepared. In the words of our metallurgist, Robert Allen, "A test is worth a thousand expert opinions." The problem is that tests are hard to come by.

Shanghai has many high rise construction projects, some in excess of 100 stories. Such buildings are becoming more commonplace, while even taller ones are being built around the world. The Shanghai construction company worked with us to conduct studies that cannot usually be done once a building is in operation.

During the construction of this building, a structure with an approximate height of 250 meters, we were allowed to conduct tests to verify the response ability in extreme conditions. I am arbitrarily defining 'extreme' as anything over the 14th floor. That is a rule of thumb I have heard.

In the United States, automotive vehicles with pumps are generally rated up to 250 psi (~17 bar), according to the standard published by the National Fire Protection Agency (NFPA 1901). This pressure will allow flows to approximately 178 meters, with no pressure remaining and no allowance for friction loss. If you allow 100 psi (7 bar) for a usable nozzle pressure, an NFPA 1901 pump can push water up 150 psi (10 bar), or about 100 metres and still have workable pressures. Thirty stories at best.

So when the unthinkable happens, and fires rage uncontrolled at stories far above our range of reaction, what do we do? It starts with homework.

Fire districts should assess their areas and plan for the unthinkable. It is not pretty, but first we reviewed some recent history. The Philadelphia fire at One Meridian Plaza was a teaching experience. My colleague, Robert Tutterow, has some excellent articles on some of the difficulties of fighting fires in high rise structures that I would urge you to check out.

The tests we performed involved specialised equipment and custom built apparatus. Not all departments are equipped to do what Shanghai did, nor do they need to, though new response ideas are evolving.

Compressed air foam is a concept I have been voicing since it was developed. Our calculations indicated a usable stream on the top floor with only 175 psi at ground level. Compressed air foam bubbles are lighter than water, and regular rules of thumb do not apply due to that. While compressed air foam bubbles are lighter and contain less water, the fact that one could move any water to such a height would be significant. The Shanghai Fire Department, while familiar with compressed air foam, did not want to rely solely on it for their pumping requirements. They wanted to move water to such a height – plain water – in case the compressed air foam system failed in some way. This required special equipment.

Heights

We built the test truck with these operational requirements in mind. In order to pump water this high, the pump would need to produce 600 psi, or about 42 bar. In order to minimise friction losses at reasonable flow rates, a special 75mm hose was located that could operate at these high pressures. Once charged to 100 stories, the water column of such a deployment exerts tremendous pressure at ground level, even when operations are ceased. Draining the hose lines is a serious safety concern.

To prepare for this situation, Darley, Darley China, and the Shanghai Fire Department worked together to utilise a special wye valve that could operate at the required operating pressures (42 bar) and provide for a means to drain these lines without danger to the firefighters or to the equipment.

The discharge hose was deployed vertically up the outside of the structure to its top floor, with special precautions taken to ensure no connections would come loose. A loose 75mm hose discharging at 42 bar could pose serious risks, and even supporting the hose was a concern. 75mm NH connections were used as similarly sized Stortz connections were not available in the pressure range required.

A two-stage pump was employed to deliver the high pressure at reasonable engine speeds. Once everything was deployed, the pump was started up, and within minutes, two nozzles were discharging at the top floor. The result was a success in that it proved 'Proof of Concept', though all admit in an actual fire scene, such a deployment could prove difficult. Access to the upper floors may be compromised, and having the proper equipment available to attempt such a knock down would be an obvious issue. Deployment of this equipment would require significant manpower and time, during which the fire could escalate. That said, being able to do so, even in a controlled environment, gave the Shanghai Fire Department encouragement that they had a tested way to attack such fires.

There are other means available to jurisdictions that may need to respond to such fires, though again, I must stress the importance of being prepared. Such resources must be identified ahead of time and plans developed for how they might be used. One such system is an almost unbelievable concept: The Helicopter Pumper.

This concept is not new, and is actually being sold in several countries. As radical as it sounds, a helicopter equipped with about 2,500 litres of water and an engine driven pump, in this case an aircraft quality Rotax engine with 64 HP (50kW), can present amazing firefighting capabilities and is proven technology. Helicopters can rise far further than fire departments can pump, and can direct the water stream into the building with more flexibility and speed than a deployed line can allow. Our OEM customer, Kanrus Co. in Kansas, USA, is specialised in this type of response, for both high rise applications and forestry needs, among others. Several videos on the internet are available to gain some familiarity in how these systems might be used. There is a lot of potential to their approach.

Finally, I would like to draw attention to a class of new products that are currently coming available to the market: drone or remote controlled surveillance aircraft. Such equipment was available for demonstration at last year's fire show in Leipzig (Interschutz 2010) and has been increasing in capabilities ever since.

Several manufacturers now make such devices. Some of these are adaptations of toys, which I could not recommend. Some devices are highly engineered specifically for the fire service and could suit multiple purposes.

Most consist of a small remote helicopter design, perhaps one- meter in diameter, which can relay fire ground information back to the command post in real time. Many are equipped with sophisticated instrumentation and capabilities. A drone helicopter can fly to any story of a high rise building, and with infra-red cameras, determine which floors are in danger. Similarly, it could improve rescue efforts for lost hikers in a forest. The type we have shown can be equipped with not only HD live video, but thermal imaging, radiation and hazmat detection, and a host of other features. Many manufacturers offer products like these, with various levels of sophistication to suit a department's needs.

With built in stability control (units will maintain their location, through GPS, within about a one-meter radius, unattended), 'come home' capabilities (one touch return or a 'low battery' signal flies it back the operator the way it came), and a viewing eyepiece to direct flight and observation with only a turn of the operator's head, I predict these will become indispensable tools for firefighting in many applications. We have demonstrated distances as far as five kilometres and heights beyond the tallest skyscraper yet to be built. It might not be able to fight the fire, but knowing where the fire lies is information to be used.

The world is getting taller. Cities are getting taller. Physics is not changing, though how we fight fires is. We need to adapt our response procedures for the new conditions confronting us. Fortunately, we have solutions available that would have been ludicrous even a decade ago. Jurisdictions with high rise buildings have new tools with which to prepare for the unthinkable. After looking at what Shanghai has done, preparation is the key tool. APF

Michael C. Ruthy is Vice President of Engineering at WS Darley Company's Pump Division

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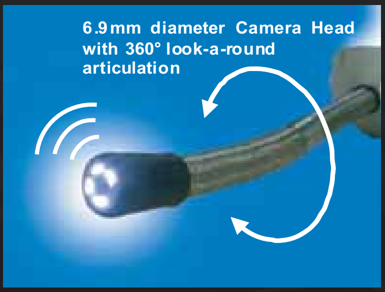

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Jan Suedmersen

@fire International
Disaster Response
Germany

USAR: Be Prepared

Every year a number of earthquakes occur all over the world, causing massive damages and loss of life. The dimensions of these catastrophes quickly exceed the possibilities and capacities of many nations to generate quick and sufficient help. Especially when it comes to rescuing trapped victims, time is a key factor as the chances of surviving decline rapidly as every hour passes.

@fire International Disaster Response Germany is a recognised non-profit organisation, which specialises in the fields of wildland firefighting and search and rescue of victims after earthquakes. @fire´s Urban Search and Rescue (USAR) team is available at all times and has an expected time of arrival (ETA) of 36 hours after an event occurs to make an immediate start on the search and rescue activities.

To enable a standard to be established for the work, and to ensure effectiveness and task organisation of the USAR teams, the International Search and Rescue Advisory Group (INSARAG) was founded in 1991 under the umbrella of the United Nations. In line with INSARAG guidelines, @fire has established a unit with the capacity defined as "medium". This requires the @fire team not only to be able to support itself for up to ten days in a civil disaster environment, but also to work in confined spaces and penetrate concrete walls and ceilings in order to rescue injured people. The team is trained to also perform adequate medical treatment.

To build an effective SAR Team – a team that can make a difference between life and death for entrapped people – highly skilled and motivated personnel are needed that have day-to-day experience in responding to emergencies of all kind, plus they need three things: training; tools; and team spirit.

Training

The @fire approach to USAR Training is based on:

1. Nearly all members are active professional or volunteer firefighters in their communities with years of experience. This includes training for technical rescue, SCBA and Hazmat. Some are also trained as paramedics. Every @fire USAR team member can perform a multitude of roles, so the team size can be kept small.
2. On top of this, @fire provides specialised training for international deployments. Every member has to go through 20 hours of basic training in international organisations, cultural awareness, personal hygiene, communications, safety and security, and base-camp operations.
3. After this basic training, every future member of the USAR team has to attend a 40-hour USAR technician's course that includes basic shoring, breaching and breaking, rope rescue and search operations.

4 After completing basic training, a variety of courses are on offer to obtain special qualifications, such as: search specialist, shoring specialist, USAR command, logistics specialist, heavy rigging, and swift-water rescue. In addition, a number of members who are specialised in their local fire departments, in such as diving and confined space operations, add those abilities to our portfolio of competences.

Because all of our members are volunteers and training has to be done in their free time, courses are very concentrated. All theoretical lessons are given to the attendees as pre-course work that will be tested at the beginning of the course. The course itself is mostly hands-on training and exercises.

To provide a state-of-the-art training under financial limitations following rules are adhered to:

- Training must be very demanding; the level of difficulty should be higher than is likely to be experienced in real situations.
- Training must be safe. It is very common worldwide to use abandoned or wrecked buildings for training purposes, but there are situations you just cannot simulate in a safe way in these buildings.
- Training should be reproducible to enable mistakes to be worked on and give the attendants the chance to make it better next time.
- Training should enhance the cooperation within the team. Teamwork along with crew resource management is another essential key to success, as the rescue work is carried out under enormous pressure, in a hostile environment, and with limited personnel.

Two examples to illustrate our approach to training:

Example: Structural Collapse Rescue Simulator

The structural collapse rescue simulator was developed by Paratech and @fire for demonstration purposes at Interschutz 2010 exhibition in Leipzig, Germany. After the event it was dismantled and rebuilt at the @fire training centre.

The simulator is modular and its design can be changed easily, to simulate a confined space, where the rescuer can be confronted with the following obstacles:

- Concrete wall.
- Wooden wall.
- Brick wall.
- Armchair, washing machine or television set.

The rescuer has to cut, breach or break through it vertically or horizontally – cutting through a high-quality leather armchair is far more challenging than one might think! Additionally, one part of the simulator's tunnel system has a movable base, seated on rollers. This floor has to be lifted and shored from the inside. This can be done with wooden shoring or a shoring system, but the use of a shoring system is much faster and is much more flexible.

The side walls are made of Plexiglas, so instructors can observe the whole operation from close-up and provide valuable feedback to the trainee.

Example: Handling of Heavy Loads

Inspired by the training done by FEMA-USAR teams, several heavy concrete obstacles are incorporated that have to be manoeuvred through, under or above. The heaviest of these objects is called "Big Moe", which weighs two tonnes.

To make the task more difficult, no power-driven devices are allowed, just manual tools such as manual jacks. To enhance teamwork, different "race tracks" are created so two or more teams can compete against the clock.

Tools

The efficiency of Urban Search and Rescue operations is mainly a question of having the right tools. But, as in every fire and rescue operation, the tools have to follow the tactics. This is particulars so in internationally-operating USAR team, where the work will mainlybe in voids in concrete buildings. The tools have to be:

Mobile

Remember. there will no big shiny fire truck from which you can jump and start to work. Every single tool has to be airlifted and brought to the scene by any possible means including helicopters, military trucks, pick-up trucks, horse carriage and – if everything fails – by carrying it.

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Efficient

The biggest tools are not always the best tools. They should be able to be held and operated in a confined space for a lengthy period of time. They should not produce too much vibration or dust, while still quickly cutting, breaching or lifting. And how these tools are driven has to be thought about. A concrete chainsaw with a small fuel-driven engine cannot be operated for a long period in an enclosed buildings. Electrical or hydraulic devices are mostly lighter, but need their own generator or pump outside the building.

Reliable

Tools have to function in circumstances that are a designer's nightmare. If they fail, the whole operation will fail. So, reliable tools are essential and, if possible, back-up key tools should be available.

There are many ways in which the tool cache can be structured and I would suggest to follow the INSARAG guidelines. Within these guidelines, the INSARAG external classification checklist clearly describes what is expected from the team and its tools). More detailed, but only a suggestion is ANNEX I: Suggested USAR Team Equipment List.

From the IEC checklist, the tools needed for rescue operations can be considered as one of the five elements of a USAR Team (the others being management, logistics, search, and medical), in line with the essential capabilities of a USAR Team:

1 Cut, break and breach through concrete walls, floors, columns and beams, structural steel, reinforcing bars, timber and building contents using "dirty" techniques (allowing debris to fall into the void space) or "clean" techniques (preventing debris to fall into the void space).

Typical tools for dirty techniques are sledge hammers, hand-held electric and gas saws with diamond blades, combi-hammers and breakers. @fire is using Hilti DCH 300 diamond cutters and TE 706 and TE 1500 hammers performing the "Chess" technique.

At the moment, we are evaluating a Lukas concrete crusher to make rapid and "dirty entry. Clean Techniques can be done with concrete chain saws and/or diamond coring systems

2 Rigging, lifting and moving of structural concrete columns and beams as part of a de-layering operation utilising pneumatic lifting equipment, hydraulic lifting equipment, winches, hand tools or a crane (and possibly other heavy machinery).

For lifting, we are using hydraulic tools like the Lukas SC 350 E, airbags with a manual pump – as normally you cannot airlift pressurised equipment – and Habegger that comes in different sizes.

3 Conduct stabilisation operations of structural elements as follows:

- Cribbing and wedges.
- Window/door stabilisation.
- Vertical stabilisation.
- Diagonal stabilisation.
- Horizontal stabilisation

Beside tools to build wooden shoring, @fire has a modular shoring system to build interior rescue shoring.

4 Technical rope capability to construct and utilise a vertical raising and lowering system and to construct a system that allows for the movement of a load (including victims) from a high point laterally to a safe point below. This requires a set of rope rescue equipment that should be very easy to use.

Another important tool consideration is personal equipment. Our personal items at rescue o perations comprise:

First-Line Gear (Stuff you should always have with you):

- Protective gear: suit, helmet, gloves, breathing apparatus, masks, knee protectors and work boots.
- Folding knife or multi-tool.
- Small flashlight.
- Examination gloves.
- Hi-energy snack.
- Pen and notepad.
- Official-looking identity card.
- Personal items such as a copy of your ID, money and medication.

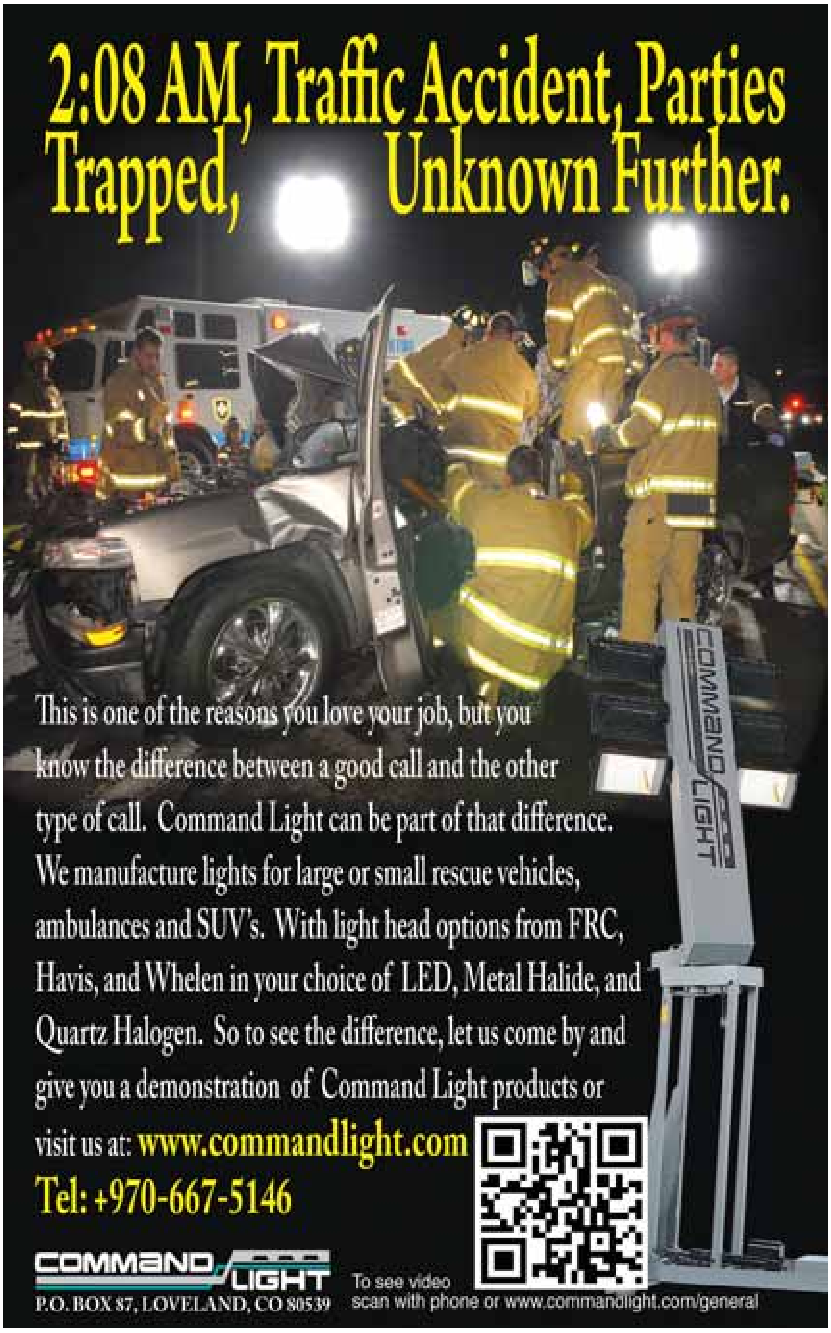
Second Line Gear (Search & Recon Missions):
Second Line gear is used if search and rescue teams are sent out for area reconnaissance, assessment and light search and rescue operations. They are very mobile, only have a light tool cache with them, such as forcible entry tools, manual hydraulic combi tools and rescue saws. They should have the capability to be operated independantly when away from the base camp for 24 hours

- Load-bearing vest with numerous pockets, customised for your function within the team.
- Hydration bladder.
- Pens, markers and grease pencil.
- Weather-proof notepad.
- Field operations guide.
- Safety glasses and wipe rag.
- Safety goggles.
- Half-mask respirator.
- Flashlight.
- Multi-colour, high-intensity chemical light sticks.
- Disposable ear plugs.
- Small, personal first-aid kit.
- Snack food, such as energy bars.
- Food Rations for 24 hours.
- Spare batteries for your head lamp, lights, GPS unit, etc.
- Compass.
- Zip ties.
- Mini roll of duct tape.
- 15-metre-long parachute cord.
- Travel-size roll of toilet paper.
- Hand sanitiser.
- Sunscreen.
- Lip balm.

APF

Jan Suedmersen is a USAR specialist with @fire International Disaster Response Germany

For further information, go to www.at-fire.de and www.lukas.de



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Bob Grieve

Delta Fire Australasia

Mining Vehicle Fires

If a mining vehicle falls victim to the ravages of fire, the cost of repair or replacement and the downtime while awaiting delivery of a replacement vehicle can have a serious impact on production schedules. But dedicated systems are available to protect the vehicle and safeguard the operator.

Mining contributes significantly to Australia's gross domestic product and is responsible for the country's largest export revenue. Australia is the world's largest exporter of coal, iron ore, lead, diamonds, rutile, zinc and zirconium, the second largest exporter of gold and uranium, and the third largest exporter of aluminium. By any measurement or international comparison, it is big business; of the world's developed countries, only Canada and Norway can possibly lay claim to mining being such a significant part in the economy.

In addition to its importance in earning overseas dollars – mostly from eastern Asia – Australian mined coal, for example, is used to generate the nation's electricity; coal is used to produce about 85 percent of Australia's electricity production.

Australia has mining activity in all of its states and territories. Particularly significant areas today include the Goldfields, Peel and Pilbara regions of Western Australia, the Hunter Valley in New South Wales, the Bowen Basin in Queensland and Latrobe Valley in Victoria, along with various parts of the outback. Mining towns with such iconic names as Kalgoorlie, Mount Isa, Mount Morgan, Broken Hill and Coober Pedy are known across the world. Australia's high labour costs and world-class safety standards, its distinctive geology, and the importance placed on mining research by successive governments and businesses has meant that the Australian mining sector is among the most technologically advanced to be found anywhere in the world.

The Mine Fire Challenge

The consequences of a fire in a mine – above or below ground – can be catastrophic, and the remoteness of the majority of mining operations in Australia makes regular fire risk assessment, fire prevention, fire protection, fire suppression and evacuation procedures critically important in terms of both life safety and asset protection. While, understandably, much of mine managements' attention is focused on below ground protection, utilising large-scale fixed engineered fire systems for the production-intensive mining operations, possibly less evident fire risks also have to be given the same level of diligent attention.

One important area that demands dedicated fire protection is the specialised plant, monster mineral-moving vehicles such as ore haulers, draglines, haul trucks, dozers and shovels on which mining and mineral extraction operations depend. Not only is this equipment extremely

expensive to replace with a considerable delivery lead time – such equipment can often takes many months to replace – extensive downtime and business interruption, in the event of a fire there is also a very real life safety threat to the equipment operator. This machinery demands extraordinary, specialist protection to provide fire suppression for the equipment and a thermal barrier to protect and the operator's skin and clothing from heat, fire and flame.

Vehicle Fire Protection

The size of these machines means that, in many cases, if no fire detection / suppression system is installed the vehicle operator may not be aware of a fire until it is well advanced. Additionally, the precise nature of the fire hazard that these mineral moving vehicles present has to be carefully considered if the detection and suppression solution is to offer the maximum protection. Many operate virtually around the clock, 24 hours a day, seven days a week in what can only be described as an aggressive environment, generating considerable heat from the engine blocks, manifolds, turbochargers, and the vehicle's breaking systems. The vehicles also have to contend with high ambient temperatures, intense temperature variations in the engine compartment and near constant and substantial vibration.

In addition to the vehicle's fuel and the risk of fuel line ruptures, fire safety means taking into account any number of flammable liquids present throughout the engine compartment. These include hydraulic, brake, automatic transmission and power steering fluids, along with combustible accumulated grease on the engine block, for which frayed or damaged electrical wiring can easily provide the ignition source.

In fact, the Australian Standard, AS5062-2006 (Fire protection for mobile and transportable equipment) specifies that a risk assessment be undertaken in conjunction with stake holders, such as OEMs, mine management, operators, maintainers of the equipment and suppliers of fire suppression equipment to ensure that risks are identified for all facets of the machine and its environment.

Experience worldwide has shown that one of the most effective ways of dealing with this unique set of challenges is to use tested and Listed pre-engineered system such as the Amerex "VF" DCP system or the Ansul A-101 DCP vehicle fire suppression system.

The Amerex "VF" system is a specially-developed vehicle fire protection system that utilises linear or spot detection devices that alert a control module. This control module in turn alerts the vehicle operator that a fire has been detected and subsequently activates a fire suppression system. Heat from the fire activates the linear or spot detection devices that are located strategically throughout the "at risk" areas of the vehicle; the control module immediately sounds its integral alarm and, after a pre-set time delay period, the control module actuates the fire suppression system. The system can also be operated manually.

The suppressant agent storage cylinders are pressurised using nitrogen (N) expellant gas cartridges. Specially developed dry chemical extinguishing agent is expelled from the storage cylinders via a network of distribution hoses leading to the per-identified fire prone areas. Discharge nozzles direct the suppression agent.

Another option is the foam fire suppression systems that are used extensively throughout Australia and Asia. These systems are available in both engineered and pre-engineered designs. For example, pre-engineered systems such as the Chubb vehicle suppression system, like many of those on the market, use pre-set parameters for the distribution of pipework and nozzles. Engineered systems such as the ETI Fire Systems offering use a calculated approach using a sophisticated software and risk assessment process. The AFFF (Aqueous Film Forming Foams) foam provides cooling of hot components and reduces the

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chance of re-ignition and is able to cover fuel spills that may occur under the vehicle. Options have been designed to allow various levels of protection, from fully automatic detection and suppression systems with full engine shut down and cab monitoring, to simple suppression-only systems with manual actuation.

Other benefits of the system include flexible siphon tubes for horizontal cylinder mounting, reinforced extra strong brackets with the smallest possible space demand, and larger capacity cylinders with higher flow valves.

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Ensuring Operator Safety

Fires in off-highway vehicles such as mineral moving vehicles can quickly engulf the engine compartment and either threaten directly the life of the vehicle operator or cut off his or her escape route as the flames spread via the wheel arches or ignited fuel spillage.

To overcome this high-risk challenge, many now consider it essential to install a solution that provides direct personal protection for the operator, providing life-enabling time to escape and protected egress route options.

Such a system is Delta Fire Australasia's Arctic Fire TES system, designed to increase the level of operator safety and reduce fire damage to off-road vehicles that operate in and around molten metals. It uses a liquid fire extinguishing agent that emulsifies and cools heated materials more quickly than water or ordinary foam, and has already become widely adopted in the steel industry where it is used for protecting smelting-operation pot carriers that transport superheated materials.

The system is designed to disperse the suppression agent throughout the cabin area, spraying the vehicle operator from above and below. This reduces the heat and smoke in the cabin area as well as minimising the prospect of injury should the emergency necessitate the operator having to exit the vehicle. The liquid fire suppression agent knocks down the flame, reduces smoke, eliminates heat and cools superheated objects and surfaces. Objects wetted with the agent will not support combustion and are protected from heat and flame. Most significantly, the agent is non-corrosive, non-staining and is safe when sprayed directly onto the vehicle operator.

An "escape component" is part of the solution, incorporating an escape hood and exit path spray. The escape hood withstands temperatures of up to 1000°C for a short period of time to enable the vehicle's operator to safety exit when in close proximity to excessive heat or flames. The exit path suppression agent spray is designed to provide a "corridor" to allow the operator to exit the vehicle. In addition to providing operator safety, this system can also be used to provide fire suppression for engine compartments and areas susceptible to damage from radiant heat. A tyre spray component option can be installed that will wet the rubber tyres of the vehicle, extending tyre life by reducing the damage caused by charring and flame contact.

The Cost Equation

With heavy mining plant easily topping the million dollar mark, the cost of fitting effective fire detection and suppression to new equipment or retro-fitting it to existing plant is miniscule. Certainly, the risk of fire is not high, but the consequences are significant. It can surely be only a matter of a few hours downtime following a fire before the cost of lost production exceeds the fire detection and suppression installation cost. Add to this the cost of potential litigation if the vehicle operator is injured or killed and the equation loses all comparison. APF

Bob Grieve is Managing Director of Delta Fire Australasia

For further information, go to www.deltafire.com.au

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What's "Critical" When it Comes to Asset Protection?

Scott Starr

Firetrace International

The term "business critical asset" has now been around for sufficiently long for its true meaning to be often somewhat lost. What exactly are business critical assets, and how are they best protected?

The key word is, of course, "critical". But how is that defined, and how is its criticality assessed? The usual answer is that a critical asset is an asset on which the company depends. But that is far too simplistic and demonstrates a lack of real understanding.

Critical assets are often deemed to be those that have the greatest impact on the organisation's ability to perform. However, this overlooks the essential characteristic or characteristics that make a particular asset "critical" in the first place. But what might these characteristics be?

- **Replacement Lead Time.**
  If the asset can be replaced promptly without any significant impact on the company's ability to perform, it hardly warrants the accolade "critical". It would be better described as "important" or "essential" rather than "critical". Of course, the replacement lead time will have a significant bearing when determining into which category the asset falls. It is also important to keep up to date regarding the supply position; what might be able to be replaced promptly today may be on a long lead time in the future.
- **Replacement Cost.**
  Being readily available is of little consequence if the cost of the replacement asset is so high that the company is unable to fund the replacement immediately, or raise the capital within an acceptable time frame. Again, this raises the lead time question.

On this basis, if the asset is essential to maintaining business continuity, if replacement (either directly or by sourcing it from elsewhere) is not available within an assessed reasonable time, or if

finance is neither available immediately nor can be arranged within an acceptable timescale, then the asset can be reasonably deemed to be genuinely "critical".

Another important step in identifying a critical asset is to follow what might be described as the critical asset audit trail. Few critical assets are stand-alone entities, so it is important to ascertain the status of the assets upon which they might depend. For example, a CNC machine tool may itself be reasonably cited as "critical". However, it requires power to operate, so the machine's electrical controls are, in all probability, critical to the machine tool's ability to perform. In short, the machine tool can be in first rate working order, but a failure of its external control equipment or power can have the same impact on production as if the machine itself had been put out of action. Both items, the machine tool and the electrical cabinet, are therefore potentially critical assets.

An important step in identifying a critical asset is to follow the critical asset audit trail. Few critical assets are stand-alone entities, so it is important to ascertain the status of the assets upon which they in turn depend.

Following this audit trail approach both backwards and forwards from a particular asset will provide a much more realistic picture for the company's management to establish precisely what is truly "critical". Almost inevitably, there will be more items of critical importance than was initially anticipated; there are also almost certain to be a few surprises.

A wartime example aptly illustrates the point that destroying the ability to create one small, simple component can have a devastating effect on the total production. During the Second World War strategic bombing attacks were aimed at crippling the German aircraft industry. The target was not, as might be expected, aircraft production factories; rather it was factories where ball-bearings that were "critical" to aircraft production were made.

Critical Asset Fire Risk

So, having established which of the company's assets are "critical", the next question is to determine what risks they are exposed to and how these can best be mitigated. There is no doubt that from all of the available statistics from around the world that fire ranks as one of the main threats.

Often, management's reaction to this is to assume that the building's facility-wide fire detection and alarm, and possibly its fire suppression system, are more than adequate for the task. This may be far from correct in terms of both practical effectiveness and cost effectiveness, as the vast majority of business critical assets are housed in cabinets or enclosures and so present a unique fire response challenge.

The reality in these situations is that even with the most sophisticated and integrated facility-wide installations, by the time a ceiling-mounted smoke, heat or flame sensor or a beam detector has been activated by a fire in, for example, in an electrical control cabinet, the cabinet and its contents are all but certain to be extensively damaged, if not completely destroyed. By their enclosed nature, these enclosures or micro-environments are effectively isolated from the facility's main fire detection and alarm installation and fire suppression facilities.

The only effective solution is to provide dedicated protection within the critical asset's enclosure. As well as being the only way to ensure swift and effective detection and suppression, this is also by far the most cost effective option. Even if you accept the delay in smoke or heat from the enclosed fire reaching a ceiling mounted detector, when activated it will, if linked to a suppression system, discharge a hugely wasteful volume of agent, filling the entire protected zone to suppress a fire in a small enclosure that by then will almost certainly have been destroyed.

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Consider again our CNC machine's electrical equipment cabinet example. A fire can break out for several reasons including cable fatigue, incorrect installation, overloaded circuits, equipment failure or any number of environmental factors. So, the only way to resolve the problem is to provide protection precisely where it is needed – inside the cabinet or micro-environment.

Agent Selection

As the threat posed by each hazard can differ significantly, providing effective dedicated fire protection for these enclosed environments calls for a wide choice of extinguishing agents. The fire suppression solution chosen therefore has to be sufficiently versatile in terms of suppression agent options that it can be tailored to the precise fire risk. Nowadays, with widespread concerns over sustainability and environment impact this has to include the latest clean agents such as 3M Novec 1230 Fire Suppression Fluid and DuPont FM-200, both of which are effective in a wide range of applications, and particularly for protecting sensitive electrical equipment.

Other options include ABC dry chemical agents, BC dry chemical agents and D dry chemical agents for – as each prefix letter indicates – Class A fires that involve freely burning materials such as wood and paper; Class B fires that involve petrol, diesel and other flammable liquids; Class C fires that involve flammable gases; and Class D fires that involve flammable metals. CO_2 [carbon dioxide] is another widely used suppressant. AFFF [Aqueous Film Forming Foam] concentrate is another option that needs to be available if a truly comprehensive solutions offering is being made.

System Checklist

There are a number of characteristics that are essential for a fire detection and suppression system to be considered as suitable for in-cabinet critical asset protection. They are:

- The solution should combine fire detection and suppression into a single, integrated package.
- It should have the ability to provide around-the-clock dependability and 24/7 unsupervised protection, as many assets remain in operation during "lights out" production.
- The system should stop a fire precisely where it breaks out and before it has any opportunity to take hold.
- It should require no external electrical or other power that has the potential to fail and so put the system out of operation.
- The system should respond to a fire with 100 percent reliability.
- It should ensure an absence of false alarms.
- On suppression discharge, it should not damage the very equipment it is there to protect.
- The solution should comply with the highest international approval and certification standards.

For certain critical assets it may also be important for the system to unaffected by vibration, dust, debris and airflow, be able to contend with extreme temperature variations, or be intrinsically safe.

System Selection

Few fire detection and suppression systems can meet this specification in full; one that can is Firetrace, an automatic fire suppression system that was developed specifically for these in-cabinet critical asset applications. It has proven to be so successful that today more than 150,000 installations have been completed successfully.

It is a "self-seeking", stand-alone solution that is entirely self-contained and does not require an external power source. The system comprises a cylinder that contains the chosen extinguishing agent, which is attached to proprietary Firetrace Detection Tubing. This small-bore polymer tubing is a linear pneumatic heat and flame detector that was developed to deliver consistently the desired temperature-sensitive detection and delivery characteristics. It detects along the entire length of the tube, immediately detects a fire at its source and ruptures activating the release of the suppression agent, extinguishing the fire precisely where it starts and before it has had time to take hold.

There are two systems from which to choose. The Firetrace Direct System utilises the Firetrace Detection Tubing as both the detection device and the suppressant delivery system, whereas the Firetrace Indirect System uses the tube as a detection and system activation device, but not for the agent discharge. The rupturing of the tube results in a drop of pressure causing the indirect valve to activate. This diverts flow from the detection tube and the agent is discharged from the cylinder through diffuser nozzles, flooding the entire enclosure.

Key to its success is that Firetrace is the only UL [Underwriters Laboratories] listed and FM [Factory Mutual] approved tube-operated system in the world that is tested as an automatic fire detection and suppression system. It is also approved by more than 25 other internationally renowned and independent accreditation and approvals agencies. **APF**

Scott Starr is Marketing Director at Firetrace International

For further information, go to www.firetrace.com

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Watermist Fire Suppression Systems

– for Commercial Low-hazard Occupancies

Watermist fire protection systems are fire suppression systems that have emerged as an alternative fire safety solution for specific applications over the past few decades – but are they suitable for commercial low-hazard occupancies?

A watermist system is a fire suppression system that, when activated, will discharge a spray of water droplets from a nozzle (or array of nozzles). The sizes of watermist droplets will typically be smaller than those discharged by traditional sprinkler systems. A system may operate automatically when nozzles are exposed to a sufficiently high level of heat to activate a frangible glass bulb or solder link contained in a nozzle.

Some systems can be linked to a detection system and use open nozzles, while other systems can be manually operated. The system will comprise a number of components to provide a water reservoir, water pressurising system and pipework to deliver water to spray out from the system nozzle/s. Different watermist systems operate at different system pressures between about 3-bar and 100-bar or more. Watermist systems can suppress fires by wetting, cooling and through localised oxygen displacement (by conversion of water droplets into steam in the flame zone).

Background

In the UK and elsewhere, watermist systems are increasingly being considered and used for the fire protection of buildings, including offices, hotels and other commercial premises. Watermist is seen as an exciting new technology by many in the fire industry and systems may also offer additional environmentally attractive design. However, for those responsible for specifying systems, approving building designs and insuring properties, there is a challenging lack of relevant, independent advice and information on their suitability.

Watermist systems for protection against the damaging effects of fires come in a multitude of different shapes and sizes. Historically, different systems have been tested and demonstrated to be effective against a number of specific applications. A few examples include their use in cabins on board ships, in machinery spaces or for specific localised protection of objects. There are further examples of effective watermist systems tested for the protection of small rooms (such as hotel bedrooms, prison cells or domestic dwellings).

The mechanisms for successful watermist operation in a fire event and the variables that influence the effective performance of systems – where the volume of the compartment is limited – have now become well established through many testing and research programmes.

Watermist systems will typically discharge significantly less water than traditional sprinkler systems. For many applications this is an advantage both in terms of the design requirements of the system and the reduced potential for water damage in the event of a system operation. However, what is critical is that the ability of a system to tackle a fire using less water is not compromised. For large open spaces where there may be significant quantities of combustible material, the suitability of watermist protection needs to be carefully assessed.

Third Party Certification

Due to the diversified nature of watermist systems and their many bespoke designs it has been a great challenge to standards writing authorities and third-party certification bodies across the world to establish suitable standards and certification schemes. This has led to a loosely regulated installation history for watermist systems and often, a lack of confidence in their fire suppression performance.

To address this issue, The Loss Prevention Certification Board (LPCB) in the UK will be publishing a Loss Prevention Standard (LPS 1283) and certification scheme for the approval and listing of watermist systems for use in commercial low-hazard occupancies. The scheme will support and augment the requirements of DD 8489 'Fixed Fire Protection Systems – Industrial and Commercial Watermist Systems'. In addition, LPCB also intends to establish a watermist system installer scheme (LPS 1284).

Manufacturers and suppliers will be able to undertake LPS 1283 to verify the components and design methodology of their watermist system. Installers of the manufacturer's watermist systems will be able to undertake LPS 1284 to verify their competency for design, installation and maintenance. End users of watermist systems will be responsible for the on-going maintenance of systems and in particular maintenance of the building fire load and fire hazard classification consistent with the watermist system design. This will mean it is necessary for the 'Responsible Person' under the Regulatory Reform (Fire Safety) Order, 2005 in the UK and more broadly anyone responsible for fire safety in buildings, to conduct a fire risk assessment and ensure compliance with the specified criteria of the certified system.

As stated previously, critical to the successful operation of a watermist system are the system design details. Of equal importance are the building design details – the fire loads, obstructions, ventilation, ceiling height, compartmentation and openings in the protected space. These design details need to be fully addressed in both the fire performance tests and installed systems to ensure their effectiveness. Therefore, the LPCB certification scheme will contain restrictions with respect of floor area (for certain systems), ceiling height, ventilation, fire load density, fire growth rate, height of combustibles and obstructions. The development of this Loss Prevention Standard was underpinned by a programme of research by the BRE Trust as explained below.

Experimental Programme

The BRE Trust has recently funded a three-year watermist research programme, supported by industry partners. The programme included large scale fire tests conducted by BRE Global at its Burn Hall laboratory near Watford in the UK.

To assess the performance of watermist systems, three key experimental tasks were undertaken:

1 A series of single wood crib fire tests to evaluate the influence on the effectiveness of the watermist system fire suppression capability of; water flow/pressure, nozzle position in relation to fire position, obstructions, ventilation and compartmentation.

2 Development of a full scale fire test protocol for commercial low-hazard occupancies based on a 'stylised' office fuel loading.

3 Testing of a sprinkler system and industry provided low and high pressure watermist systems to establish their performance against the developed fire test protocol.

Key Findings from the Research

1 From the series of tests with a single wood crib, it was demonstrated that, for the specific conditions tested:

- The position of the fire in relation to the position of the watermist discharge nozzle was critical to the fire suppression effectiveness of the spray, even within the nominal area of coverage provided by the nozzle.
- The presence of shielding, that is an obstruction in the direct path of the water spray to the fuel source, resulted in reduced suppression effectiveness.
- Ventilation flows detrimentally affected the performance of the watermist suppression and influenced the fire growth characteristics.
- Watermist flow rate/pressure and ceiling height can influence the effectiveness of the suppression provided by a system.
- For otherwise equivalent situations, the watermist system tested was more effective when tackling a fire in a compartment than in open conditions.

2 In the development of the full scale test protocol an assessment was made of typical open office areas. Information was gathered and reviewed from an office survey, office fire load surveys, office fire test data and standard test fires. A 'stylised' office scenario was arranged consisting of two combustible walls, a chipboard table with foam sheets, cardboard and paper loading and with two wood cribs (but also containing plastic material) beneath the table top.

The scenario met the following criteria:

- The fuel loading was representative of a commercial low-hazard occupancy, fire growth rate and heat release rate.
- It was a challenge to a watermist system with a shielded fire source and open ceiling.
- The materials were closely specified, easily sourced and could be repeatedly obtained. The scenario was simple and relatively cost effective.
- The arrangement allowed for clear system 'pass/fail' criteria to be developed.

3 In the full scale tests carried out, the results were as follows:

- The sprinkler system, operating at a water coverage density of five mm/min provided effective fire suppression.
- All the watermist systems demonstrated lower temperatures at ceiling level and reduced fire damage compared to a 'baseline' unsuppressed fire 'freeburn'.
- However, the low pressure watermist system at a nozzle spacing of three metres by three metres did not provide effective suppression of the fire and did not meet the test criteria.
- The high pressure watermist system (installed on a three-metre and four-metre spacing) did not provide effective suppression of the fire and did not meet the test criteria.
- A low pressure system, tested at a spacing of 2.5 metres by 2.5 metres and a water coverage density of five mm/min (equivalent to the sprinkler system coverage) did suppress the fire and meet the test criteria successfully.

The scope of the testing was necessarily limited and other system arrangements may perform differently.

Conclusions

Overall, the full-scale test results were of concern. A significant number of watermist system arrangements were not able to provide expected levels of fire protection for the tested scenario (open plan area with obstructed fire loads and a high ceiling). In terms of the design of the tested systems, in many instances, the spacing between nozzles was too great and the quantity and momentum of water discharged too low to provide effective fire suppression. The test work demonstrated that watermist system effectiveness cannot be assumed and that it is essential to verify system performance against realistic, reliable and repeatable fire test protocols.

Output

A report titled "Watermist fire protection in offices: experimental testing and development of a test protocol", published by IHS BRE Press (FB 34), provides the detailed results from the research carried out. The report describes the experimental study and provides fire test evidence to assist in the understanding of watermist systems.

The test protocol has now been adopted by the British Standards Institute and forms part of a recently published watermist draft for development standard in the UK, DD 8489 'Fixed fire protection systems – Industrial and commercial watermist systems'.

Summary

For many in the fire industry, watermist systems will continue to offer an alternative to more traditional systems. The progress being made now has the potential to result in robustly tested and certified watermist systems for low-hazard commercial premises. This will help to provide confidence to authorities having jurisdiction, building owners and insurers that a watermist system is suitable for the intended application to which it is being installed. APF

BRE Trust is a charitable company in the UK. Its objectives are through research and education, to advance knowledge, innovation and communication in all matters concerning the built environment for public benefit. As a charity for research and education, the BRE Trust commissions 'for public benefit' research from the BRE Group of companies and elsewhere. The Trust is the largest UK charity dedicated specifically to research and education in the built environment.

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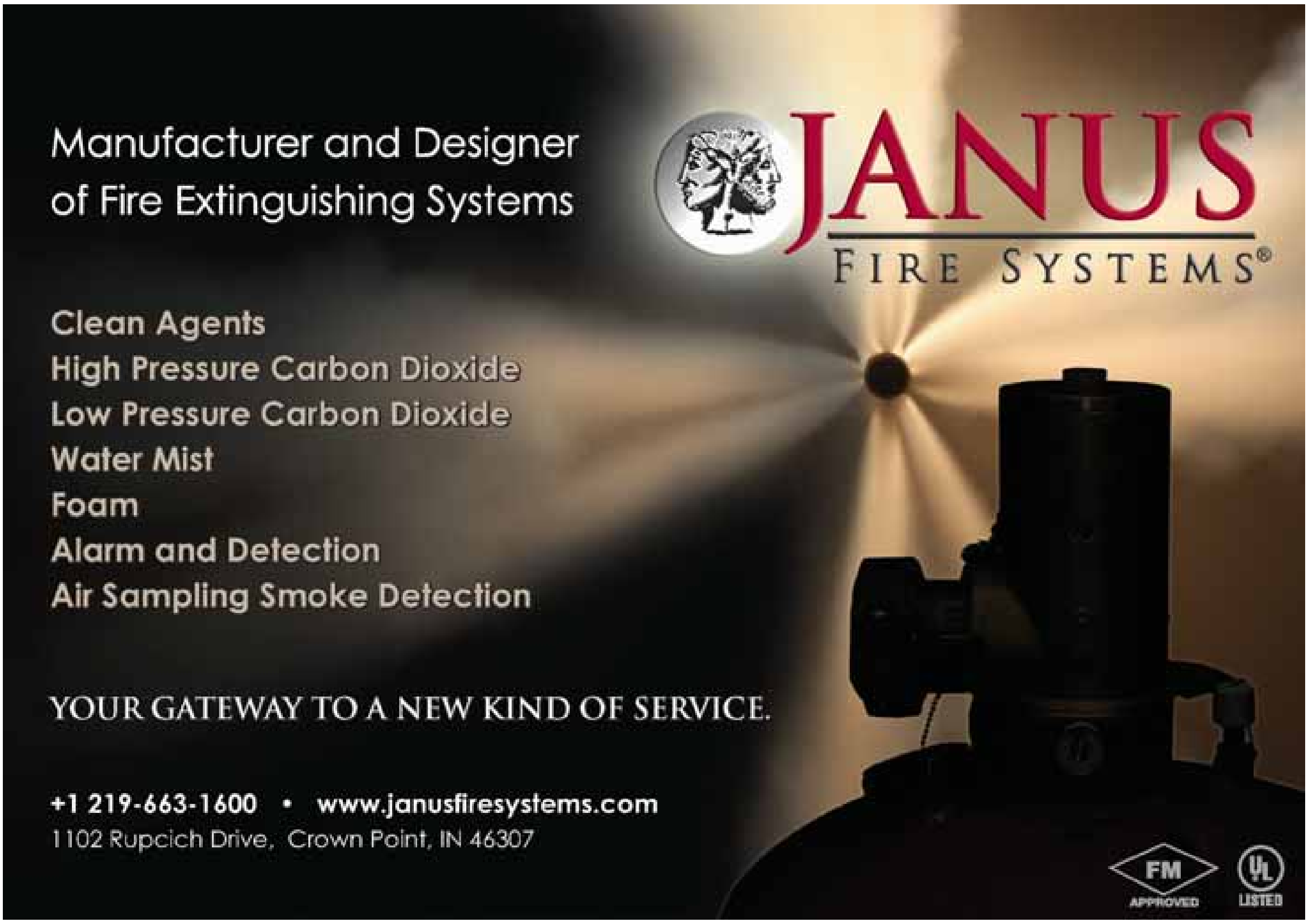
For further information, go to www.bre.co.uk



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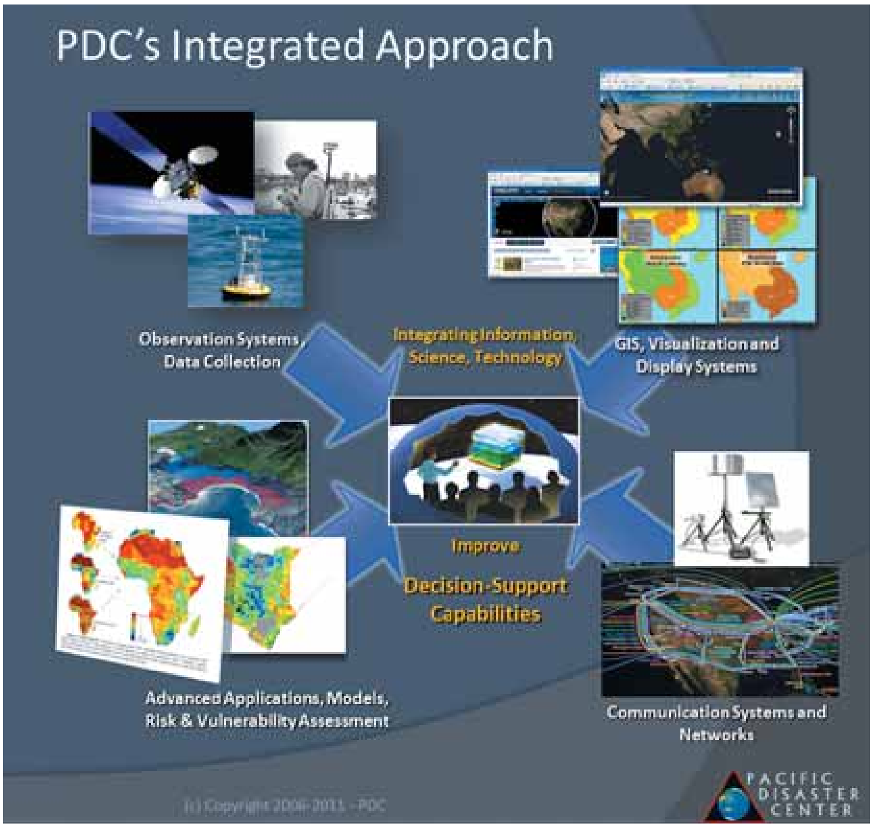
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Fuelling Disaster Risk Reduction & Increasing Resiliency

Ray Shirkhodai

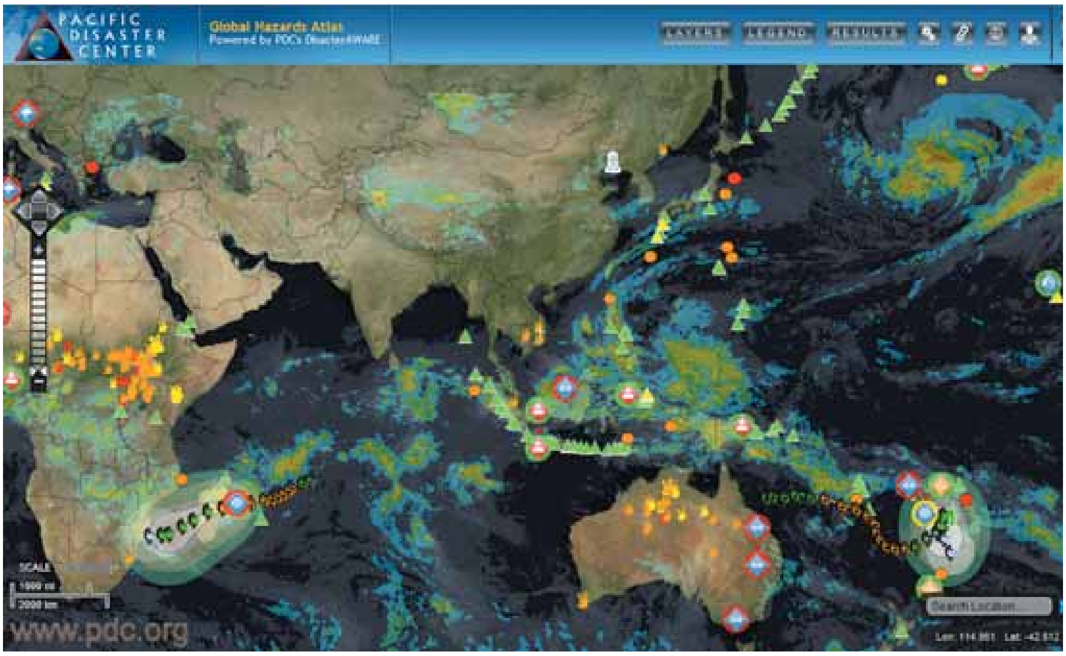
Pacific Disaster Centre

Are we responsible for creating disasters? Can we help reduce disaster risks and increase resilience? Admittedly, increasing resilience involves more than risk reduction, but intuitively, improving resilience plays a major role in reducing risk.

Evidence – ranging from ancient structures built to redirect flood waters to modern business continuity practices – suggests that the general concepts involved in understanding hazard risks have been around for hundreds of years, and have been used as a basis for risk mitigation. But, it was only recently that the phrase "disaster risk reduction" (DRR) hit the mainstream. Before, DRR was mostly a subject of academic research, and disasters were largely viewed as indiscriminate and unavoidable furies of nature that devastated Earth's human inhabitants. And the mainstream consensus was that concentrating on improving our ability to predict natural hazard occurrences was the main means to lessen the expected losses.

Indeed, advances in the physical sciences and improvements to observation systems, especially during the 20th century, helped tremendously, enhancing our knowledge of many natural hazards, and resulting in improved engineering practices, early warning, evacuation, and response. Yet, these gains in risk reduction were being quickly outpaced by rapid population growth, and by ill-informed or ill-enforced policies that still allowed growth and development in hazard-prone areas.

Furthermore, until the last quarter of the century, there was little recognition of how the social, economic, political, and cultural characteristics of a community affect its vulnerabilities. This information was important in developing effective policies to reduce risks and increase resiliency. Social scientists played a key role in identifying the significance of these characteristics and in estimating their influence – individually and collectively – in terms



PDC's Global Hazards Atlas

of relationships to stressed situations and disasters.

Still, painting a more comprehensive picture of risks to better inform decisions related to governance, policy, planning, and public safety required closer integration of the inter-disciplinary practices, mainstreaming of relevant concepts, and wider dissemination of the results.

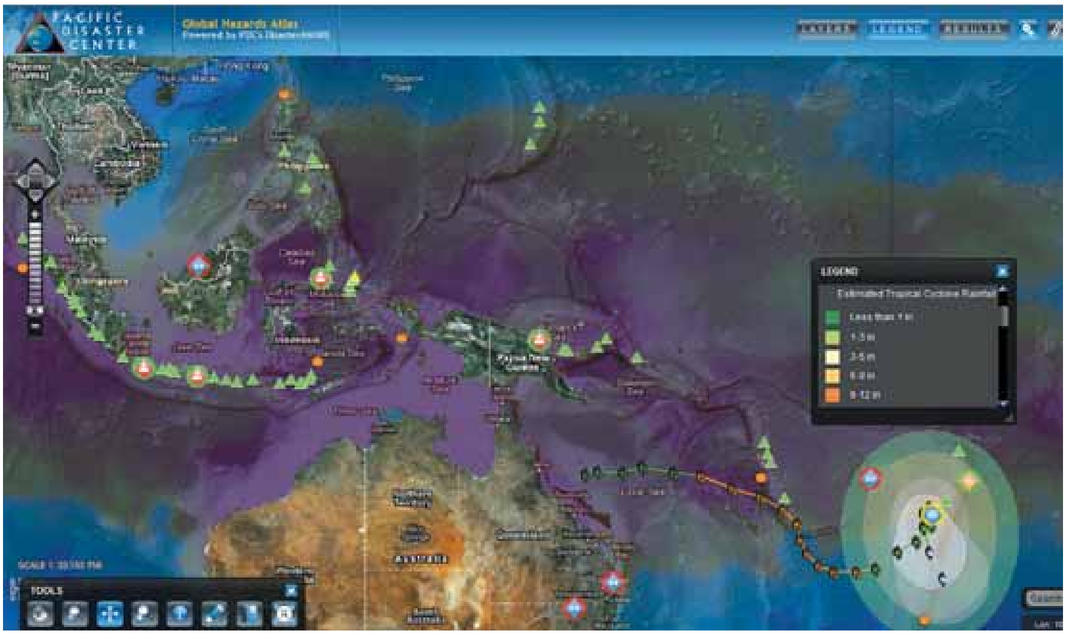
While we do not suggest that merely having access to the latest sciences and integrated technologies is sufficient for improved DRR practices, we do propose that efforts to reduce disaster risks have been largely fuelled, facilitated, and expedited by momentum in applied sciences and advances in information and communication technologies.

Today, there are numerous examples of how these advances are put to use by institutions – including Pacific Disaster Centre (PDC) – that are helping to get the right information to the right audiences at the right time. And, those who take advantage of these capabilities are helping to reduce disaster risks and increase resiliency.

What is Disaster Risk Reduction?

DRR is defined by the U.N. as "reducing disaster risks through systematic efforts to analyse and manage the causal factors of disasters, including through reduced exposure to hazards, lessened vulnerability of people and property, wise management of land and the environment, and improved preparedness for adverse events." Ultimately, the goal of DRR is to continuously reduce human and economic losses related to hazard, through a "systematic approach." In other words, DRR-related activities are guided by sound information and repeatable processes, and are grounded in related sciences and technologies that enable evidence-based assessments and methodical reasoning.

To provide a comprehensive view of the relationships between sciences and DRR is beyond the scope of a short article, but we can briefly examine major milestones in the advance of sciences and technologies that have contributed to progress in DRR practices.



Model output displayed in PDC's Global Hazards Atlas

Space-age Proliferation of Data

The space age brought forth unprecedented opportunities in remote sensing, observation, and data collection systems. These advances enabled scientists to continuously monitor environmental conditions and improve the accuracy of their observations. They also helped enhance the understanding of the parameters affecting environmental changes. As a result of collecting data from various satellites, for instance, scientists were able to more accurately detect hot-spots (suspected fires), tropical rain falls, global cloud formations, and a host of other atmospheric, geological, and oceanic conditions affecting change in the natural and built environments. Visual presentation of these data, as in the PDC Global Hazards Atlas, provides instantly understandable and actionable information.

Over time, continued observations and analysis of the collected data also led to improved capabilities in predicting conditions that are conducive to the occurrence of a variety of hazards. Together, these advances helped increase hazard warning capabilities. But, these data remained hard to obtain, and prohibitively expensive to process, archive, or analyse, limiting their exploitation to large national agencies with substantial financial resources and technical capacities.

Dawning of the Information Age

Advances in computing and communication technologies facilitated the next giant leap in the evolution of risk reduction. Relevant data could now be more readily obtained and shared, and more easily processed, archived, and analysed. The benefits were enormous.

For one thing, better archiving and faster statistical analysis of the historical data expedited development of hazard “exposure” surfaces. These surfaces help decision makers better understand the hazard risk profiles of a location, and develop policies and plans that help reduce exposure to those hazards. Another significant factor was faster acquisition and processing of data, which led to increased hazard warning time. Likewise, improved warning systems resulted in improved preparations for impacts, and in many instances, enabled effective relocation or evacuation of the exposed elements.

But this was not all. Better computational power advanced predictive modelling for many hazards and improved estimation of their impacts. Advances in visualisation enhanced abilities to decipher raw, scientific data, and facilitated communication of hazard-related information to a wider audience. They also improved geographical information systems (GIS) which helped enhance the accuracy of mapping, layering, and integrating the related information.

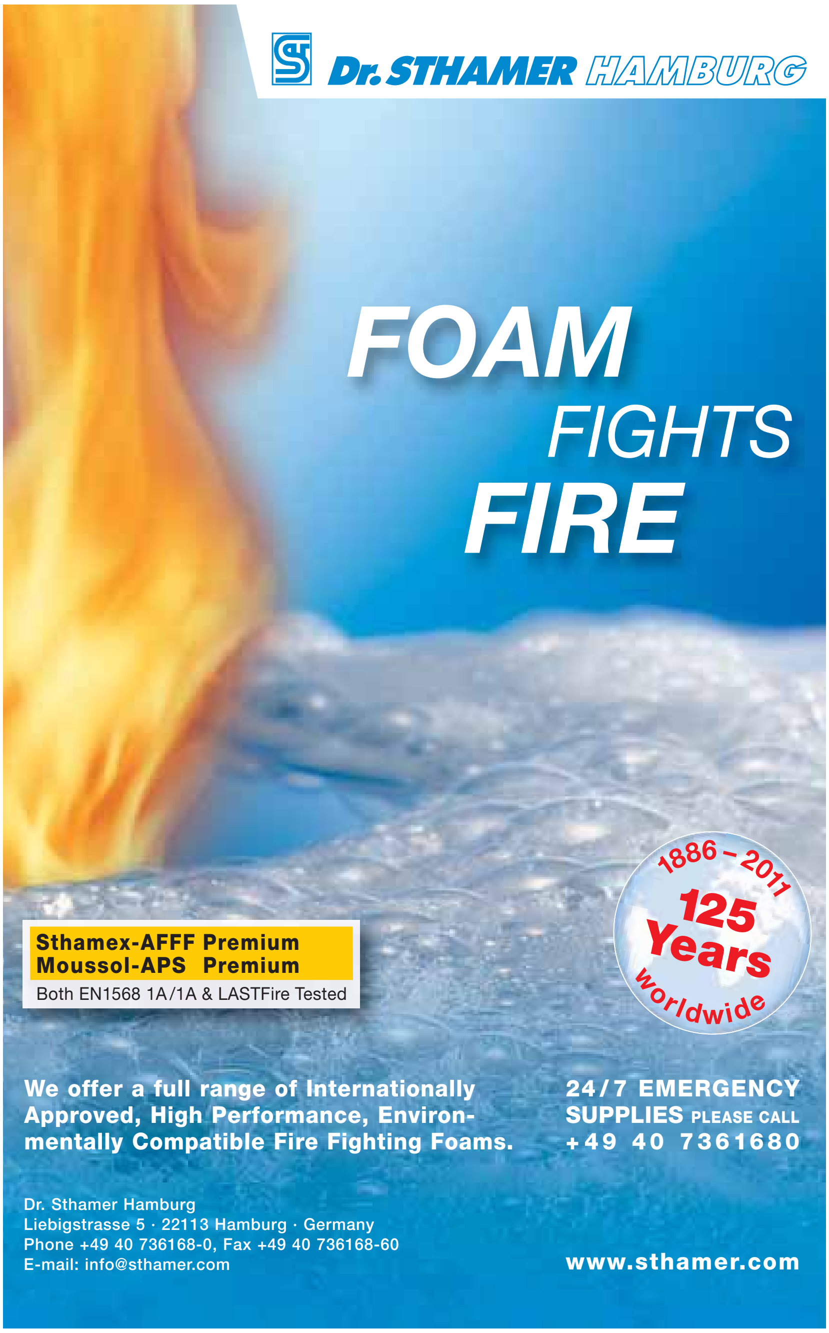
Together, all these advances helped transform data into usable information for risk reduction purposes. Yet, wider information-sharing capabilities were needed to start integrating, and ultimately, transforming the information into the knowledge needed for effective decision making.

Internet Revolution and Information “Super Highway”

The Internet is considered by many to be a natural evolution of advances in computing, communications, and networking technologies. While this is true, the Internet has had such a profound impact in advancing and mainstreaming risk reduction concepts, that it commands attention in this context. The Internet Age flung the doors wide-open to free-form, easy, unrestricted, and rather instantaneous sharing of ideas and information across the globe.

Scientists found they could quickly access information, share ideas, collaborate with colleagues worldwide, and more rapidly share the results of their work. This technological revolution speeded up the advancement of sciences, eased access to new information, and ultimately, expedited mainstreaming of risk reduction concepts.

Similarly, the Internet provided an effective environment for computer software developers to share ideas and build on each other’s work. This led to the proliferation of an enormous library of software applications, few of which were actually developed for risk reduction purposes, but many of which were ultimately modified, integrated, and used in a variety of risk reduction practices. In fact, many of these applications improved processing,



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Ease of access to the related information and improvements that made it more usable enabled DRR advocates to better leverage the latest capabilities, and incorporate the results into their decision processes. In turn, practitioners could share sound practices with colleagues around the globe, and learn from each other’s experiences. And indeed, the technology also created a convenient feedback loop between the providers and consumers of information, allowing risk reduction practitioners to communicate further needs to the scientists and technologists working to overcome upcoming DRR challenges.

Last, but certainly not the least, the Internet greatly increased the options for engaging the public as stakeholders in DRR discussions. Firstly, easy and unrestricted access to the information helped familiarise masses with DRR, effectively mainstreaming the concepts and practices. Secondly, DRR-devoted sites and related information-dissemination services (such as email, RSS feeds, etc.) provided an alternative to traditional broadcast news for delivering hazard-related content to the public in a timely manner. Thirdly, and perhaps most importantly, the introduction of social networks – most famously Facebook and Twitter – facilitated conversations and created a new medium for obtaining direct feedback from the public regarding the subject matter.

Despite all the gains in sciences and technologies that were advancing DRR agendas, the digital-divide still presented challenges. For one thing, until very recently, access to the internet was confined to fixed locations at office or home computers. For another thing, one cannot ignore the fact that the Internet is not as widely, uniformly, or readily available in every corner of the world, and it is especially sparse and expensive in developing nations. Providing such access requires extensive and expensive investments in technology, human resources, and infrastructure beyond the grasp of many.

The Age of Information Mobility

While the Internet revolution was roaring at a fantastic pace, creating a new medium for exchange of ideas and developing previously unimagined opportunities, another quiet revolution was underway, one with the potential to overcome the digital-divide challenges. First, advances in telecommunication and wireless technologies led to the development of mobile/cellular phone devices and related networks. Then, convergence of these with the latest computing, networking, and satellite technologies gave birth to “smart” mobile devices that enabled communications to/from virtually anywhere. These devices, loaded

with applications like PDC's Disaster Alert, provide users with dynamic feeds hazard information to and from any place in the world.

The contributions of this revolution to DRR practices cannot be underestimated any more than those of the preceding digital developments. Most importantly, cellular phones are already widely used around the world, including in developing nations. So, combined with Short Message Services (SMS), the devices provide the best opportunity to-date to deliver hazard information to individuals. Likewise, combined with social networks and Global Positioning Systems (GPS), the devices allow messages from individuals to be delivered to any number of recipients geo-coded to a specific source location. What is more, combined with the power of the internet and related applications, the messages may now be instantly translated into any language and shared across the world, promising a connected global community working together to reduce disaster risks.

As these technologies continue to evolve and the devices become "smarter," new opportunities arise to share richer hazard content and provide just-in-time and just-in-place information to the public. Many disaster-related applications are already becoming available that deliver hazard monitoring and warning capabilities. Other applications are being released that provide access to information about preparedness. It is not difficult to imagine the next generation of these smart applications detecting the owner's location to customise disaster information based on the specific geography and for a specific time. Similarly, these applications will be taking advantage of innovative and integrated technologies to facilitate communications among responders, decision makers, and logistics providers. Finally, these applications, yet again, will provide better means to share knowledge that will improve the mainstreaming of DRR practices.

DRR Requires More than Access to Science and Technology

In the final analysis, it is important to note once again that having access to the latest sciences and technologies is not sufficient for the implementation of DRR strategies. Whereas advances in these fields greatly enhance informed-policy, planning, and decision-support capabilities, community involvement and responsible governance are also necessary to put these resources to good use.

Every human loss attributed to a disaster is a tragedy, but, as the recent earthquake in Port Au Prince, Haiti (316,000 deceased) reminds us – by comparison to the events in Bio Bio, Chili (582 deceased), and Christchurch, New Zealand (181 deceased) – systematic DRR practices grounded in informed-decisions, utilising the latest sciences and technologies, and backed by responsible governance, make a considerable difference in reducing human and economic losses related to hazard risks.

Reducing losses and impacts pays great dividends in increasing resiliency. **APF**

Ray Shirkhodai is Executive Director of Pacific Disaster Centre

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POWER: 6,6 Kw
DIMENSIONS: HEIGHT 69 cm / 27",
WIDTH 56 cm / 22", LENGTH 113 cm / 44,5"
DRY WEIGHT: 125 Kg / 275 lbs

MCH-6/SH
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POWER: 3,5 Kw / 5,5 Hp
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DRY WEIGHT: 38,5 Kg / 85 lbs

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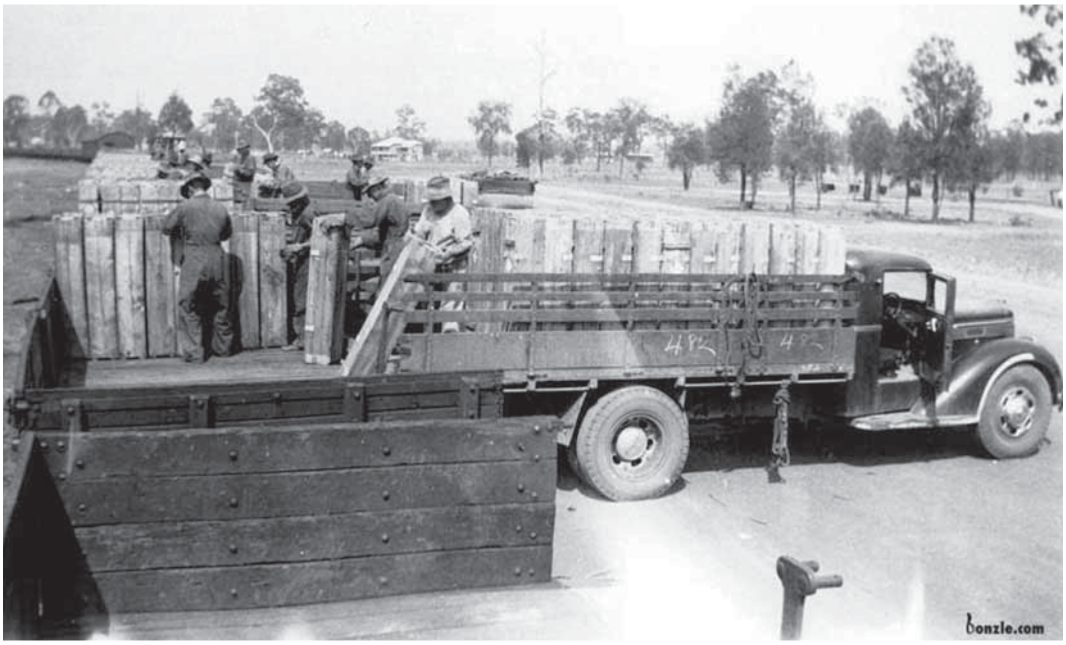

Peter Murphy

Milsearch

While the unearthing and destruction of chemical weapons is day-to-day business for defence and response agencies in many parts of the world it has not historically been a concern for the Australian response community. In recent years however this has begun to change. As legacy sites from WWII come under increasing scrutiny and pressure from development there has been a corresponding increase in exposure to sites where chemical weapons were stored or are rumoured to have been stored in times gone by.

In the quiet backblocks of Columboola, 350km northwest of Brisbane in Queensland, Australia, along the Warrego highway between Miles and Chinchilla buried bombs have formed part of the local folklore for nearly 70 years. In 1942/1943 the Columboola site was a designated as a US Army chemical weapons storage base. During a three-year period during the war the site was home to in excess of 170,000 HD (distilled sulphur mustard agent) mustard chemical rounds that were stored as part of the strategic “Brisbane Line” of defence; a chain of supply and weapons bases designed to provide support in the event of an east coast invasion.

Rumours of buried Jeeps and Harley Davidson motorbikes abound in these parts, and while no such earthly treasures have presented themselves just yet, some slightly less enticing gifts from the past have recently come to light. In 2009, during a standard due-diligence survey of a prospective open cut coal mining operation, a burial of 144 HD mustard rounds was discovered by contractors in a series of pits across the site. Police and subsequently Defence was notified and so began the biggest chemical weapons investigation and destruction campaign to be undertaken in Australia since the Second World War. The Columboola project has, in many respects, re-written the book in terms of how to undertake an effective and collaborative effort between State, Federal and international government agencies, private industry and the community.

Columboola Heritage

The Columboola site comprises some 730 hectares of land on a pancake-flat floodplain in a paddock in the middle of nowhere – an ideal site for the surreptitious storage of chemical rounds.

The site is covered by old established stands of ironbark, bull oak and popular box trees that formed ideal camouflage from aerial surveillance activities. As happens to this day, munitions undergoing the rigors of transport and handling, occasionally fail and ‘leakers’ and damaged rounds are somewhat of an inevitability. Standard practice during the war, and in fact up until quite recently, was for the munitions to be buried or submersed as an appropriate means of disposal. The trick for those of us investigating the site nearly 70 years later, in the near complete absence of accurate historical records, is to understand where these rounds were kept and how they were disposed of at the site.

Munitions Destruction

The nature of the current works at the Columboola site was divided into two streams: destruction and further investigation. The first and primary stream of work involved the Commonwealth’s requirements as a signatory to the

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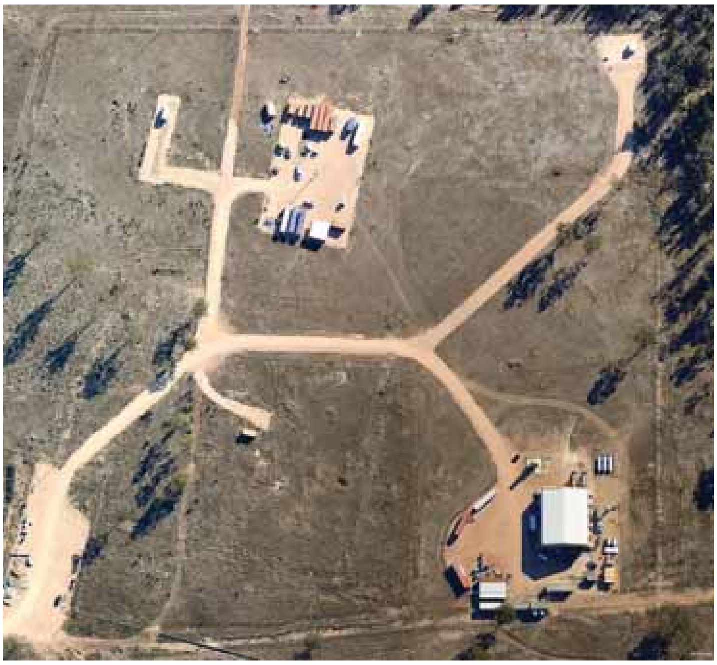


International Prohibition of Chemical Weapons Treaty, which is regulated by the Office for the Prohibition of Chemical Weapons based in The Hague. Under the treaty requirements, ASNO (Australian Safeguards and Non-Proliferation Office), as the Commonwealth representative, is required to submit a plan, under relatively strict timelines, to outline the management and disposal strategy for the munitions. Defence manages this plan and, as a result, they released a tender through the DUXO Panel (Defence Un-exploded Ordinance Panel) in late 2009 seeking responses from industry to undertake the destruction of the 144 munitions. Ultimately Milsearch, a private demilitarisation contractor based in Canberra, was successful in securing the munitions destruction contract and the TC-60 munitions destruction system provided by CH2M Hill in the US was selected as the preferred destruction technology.

Milsearch deployed to the Columboola site in August 2010 and spent the next six months preparing the site for the upcoming assessment and eventual destruction activities. Due to the isolated nature of the site this involved the establishment of all required infrastructure including roads, buildings, power, water and waste water. Milsearch partnered with OPEC Systems to complete the civil and structural works at the site. Over 12,000 cubic metres of road base was imported from local quarries to form 6km of access roads and 14,000 square metres of hardstands required for the works infrastructure. Construction efforts at the site were not helped by the wettest season on record (never good when you are working on a floodplain) but a Herculean effort by the numerous sub-contractors involved saw the timelines met and by April 2011 the TC-60 system was ready to accept its first round and the final round was destroyed in May 2011

For those with a technical bent, the TC-60 is a mature batch thermal destruction technology that has been in operation around the world for over ten years and has been involved in the destruction of over 45,000 chemical rounds including mustard, phosgene and HC smoke. The TC-60 offers a controlled detonation process using proprietary donor explosives to implode munitions under intense pressure and heat. The explosives and toxic fill contained in the munitions are destroyed by detonation, heat and pressure in the resulting fireball (thermal oxidation). A comprehensive, multi-stage air pollution control system destroys any residuals that are contained in the associated off-gassing process and a highly accurate monitoring system tracks potential contaminants allowing confirmation of successful destruction.

Stakeholder Engagement

The process of delivering the destruction phase of the Columboola project to fruition involved a strong collaborative approach between the stakeholders. To facilitate communication between the numerous involved parties a central Queensland Coordinating Group was established to assist Milsearch and Defence to confirm that the project complies with State legislation and regulations in regard to such areas as workplace health and safety and environmental protection. The function of local area coordination was managed through the regional Director of Emergency Management, Queensland.

During the assessment and destruction phases of the works, Milsearch provided the initial decontamination response adjacent to the destruction facility while a trained team from the Queensland Fire Service (QFS), located a short distance away,

stood up a comprehensive CBRN decontamination system to ensure that any major incidents were able to be expediently dealt with. Over an eight- week period QFS rostered in teams of six responders on a seven-day roster.

Similarly the Queensland Ambulance Service stood up an on-site medical response capability including ambulance and paramedic support to assist the teams on-site medical support capabilities. DERM (Department of Environment and Resource Management) worked with Defence and Milsearch to advise on and support the project's species management plan as well as the site's general environmental compliance requirements while DEETI oversaw licensing and management of the munitions and the explosive donor charges stored on site.

> **In the 65 years since the site was last used as a munitions storage base there has been considerable re-growth of trees and many of the prominent features from the war nowadays only exist as light and subtle shadows on the landscape.**

In terms of scientific support the DSTO (Defence Science and Technology Organisation) operated a portable field laboratory on the site with a full CGMS capability for analysing soil and swab samples and head spacing various waste streams waste while the US Army's Edgewood Chemical Biological Command provided a monitoring team to confirm air quality within and outside of the destruction facility.

For most of these agencies this was a unique opportunity for their operators to engage in a live chemical warfare agent environment and to test and refine their equipment, policies and procedures. At the community level Defence hosted many education and liaison evenings with the public to ensure that their questions were answered and concerns were allayed and also used these opportunities to glean some valuable local knowledge regarding the operation of the site during the 1940s.

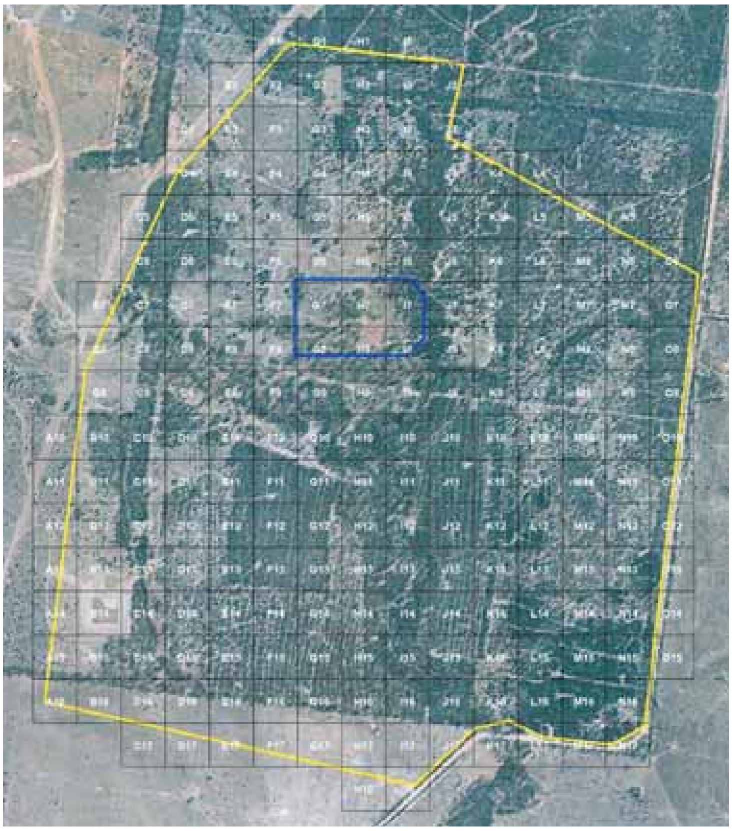
The nature of the job, the number of interested parties and the high level of interest from both within Defence and without, has put the Columboola project under considerable scrutiny. Fortunately, with the assistance of a great many number of cooperative and focused individuals, the destruction operation was completed on time and on budget without a single safety or environmental incident.

Investigation Work

Operating concurrently with the primary objective of destroying the discovered munitions under Australia's obligations to the Chemical Weapons Convention, Milsearch was also engaged to investigate the remainder of the site to determine if any additional munitions still remained hidden under the paddocks at the Columboola site.

One thing that can be said with absolute certainty when an open-cut coal mine is proposing to move onto your property is that they will find, in this case to a depth of 26 metres, exactly what lies beneath the ground. When this includes aged chemical weapons then it is prudent to take a proactive approach. To this end Defence instructed Milsearch to investigate the entire 730 hectares that constitutes the old US Army base.

In the 65 years since the site was last used as a munitions storage base there has been considerable re-growth of trees and many of the prominent features from the war nowadays only exist as light and subtle shadows on the landscape. To bring together the various sources of information that might cast some light on the location of munitions left on the site during the war a probabilistic analysis model was adopted that sought to collate the body of disparate data that exists about the site.



This strategy involved the use of different tools which were available:

- Desktop photographic review.
- Historical study.
- Micro-characterisation of the site.
- 'Union Jack' assessment of site.
- Record of tangible points of interest.

To allow the management of such a relatively large parcel of land the site was broken into 4ha blocks and a rating was given to each block to prioritise those areas that would receive further intrusive investigation operations. Milsearch are now progressively working through these areas in a three-stage process to determine if any munitions reside beneath the surface. The first stage of works involves the clearing of surface vegetation under the site's Species Management Plan. Larger trees (those greater than 400mm in diameter) are left in situ while smaller trees are mulched for soil stability and water retention or stockpiled for later provision of habitat sites.

Following de-vegetation the surface is surveyed using a specialised electro-magnetic investigative tool (Geonics EM61). The EM61 time domain metal detectors are able to detect and differentiate between ferrous and non-ferrous metals. Using this system a powerful transmitter generates a pulsed primary magnetic field in the earth that induces eddy currents in nearby metallic objects. The eddy current decay produces a secondary magnetic field measured by the receiver coil. Using this technique we are provided an accurate indication of any sub-surface metallic content.

> **The Columboola project has been a fascinating journey through the world of live chemical agent operations and it has significantly contributed to Australia's knowledge of this threat and its capacity to manage similar incidents should they arise in the future.**

To validate the geophysical survey results, an investigation team is then deployed to the block in question and the physical digging process begins. Digging for munitions is akin to a delicate archaeological excavation with specialised technicians leading the dig using a combination of excavators and hand tools.

To manage the risks associated with the potential for chemical agent release, Milsearch refined and developed its existing work instructions, used when dealing with conventional munitions, to overlay an elevated level of monitoring and safety capability. The ECBC personnel provided the minicams monitoring equipment for the works. The minicams are a portable detection capability able to monitor for HD mustard down to below 0.003 mg/m^3. This is significantly more sensitive system than the hand-held detection technologies that have traditionally been used in chemical environments and its rapid cycle times (between three and five minutes) ensures that operatives are not exposed to STEL (Short Term Exposure Limit) for any unsafe periods. Minicams are used in conjunction with the hand-held Chempro 100i, AP4CE and Cam 2+ systems, which serve as first-alarm detectors. These operatives are supported by a comprehensive on-site decontamination and medical response capability.

The Columboola project has been a fascinating journey through the world of live chemical agent operations and it has significantly contributed to Australia's knowledge of this threat and its capacity to manage similar incidents should they arise in the future. While not without its teething problems it was a showcase example of a cooperative multi-agency approach combined with a very high level of industry collaboration and support. Before too long Columboola can return to its sleepy status in outback Queensland and finally all the rumours of that elusive buried Harley Davidson might be put to rest. APF

Peter Murphy is Project Manager of the Columboola Chemical Munitions Destruction Project and Managing Director of OPEC Systems

For further information, go to www. milsearch.com.au and www.opecsystems.com.au

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Lee Coates

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Steel Appeal in Fire Safety

It is estimated that there are some 195,000 deaths each year from fire, and fire-related death ranks among the 15 most common causes of death for children and young adults. South-East Asia alone accounts for just over 50 percent of the total number of fire deaths worldwide.

Most, of course, are domestic fires. However, the human cost can be much greater when fire breaks out in a commercial building – particularly in countries that have either inadequate fire safety regulations or the means to stringently enforce them.

That was certainly the case in a fire a few years ago in a textile factory in Dhaka, Bangladesh. In that fire, men and women, most in their teens and early twenties, tried to escape down a narrow stairway barely 1.5 metres wide. In the ensuing stampede, seven women were trampled to death and fifty injured. However, what made this fire worse was that it was not an isolated incident. In November 2000, another 45 Bangladeshi garment workers were killed and 100 injured in a factory fire caused by an electrical short circuit. Among the victims were ten children. The stairwell was so crowded that workers broke windows and threw themselves out.

In 2001, 24 workers, mostly women, died in yet another factory fire in Dhaka, bringing the total number of lives lost in factory fires in the country to 84 in that one year alone. The tragedy, caused by faulty electrics, was again exacerbated by workers from several production units converging on the same escape stairway.

The Fire Challenge

The fire regulations on which building safety depend are themselves based on an understanding of fire dynamics – the fundamental relationship between fuel, oxygen and heat – the so-called fire triangle on which all fires, intentional or otherwise, depend. Get those three elements together and the fire triangle is joined by a fourth

element – the chemical chain reaction that is actually the fire. In technical jargon, the triangle of combustion then becomes a tetrahedron.

It is a geometry that can either be friend or foe, as fuel and oxygen molecules gain energy and become active. This molecular energy is then transferred to other fuel and oxygen molecules to create and sustain the chain reaction. In an uncontrolled fire in a building, how it spreads of course depends on a whole range of factors – from the type of fuel (everything from ceiling tiles to furniture) to the building construction and ventilation.

Taming fire generally involves the removal of heat, in most cases using water to soak up heat generated by the fire. Without energy in the form of heat, the fire cannot heat unburned fuel to ignition temperature and the fire will eventually go out. In addition, water acts to smother the flames and suffocate the fire. But what is really needed is containment – to prevent the fire spreading from its original location. Those protective barriers, often external curtain walling or internal glass screens, must also provide escape routes for the building's occupants – what was lacking in those fires in Bangladesh.

The Role of Fire-resistant Glazing

That is where fire resistant glass and glazing systems are so important, because modern steel systems are so technically advanced that they have overcome the limitations inherent in the glass itself.

The biggest limitation is that glass softens over a range of 500°C to 1500°C. To put that in perspective, a candle flame burns at between 800°C and 1200°C. In a typical flashover fire inside a building, temperatures can reach between 1000°C and 1400°C. These temperatures can disrupt the integrity of conventional panes of glass, which can crack and break because of thermal shock and temperature differentials across the exposed face. This will compromise the compartmentation of the building's interior allowing fire to spread from room to room.

That can, incidentally, be a problem that a sprinkler system actually causes. There have been several notable cases where cold water from a sprinkler system has come into contact with heated non-fire rated glass, causing the glass to break and allowing more oxygen to the seat of the fire.

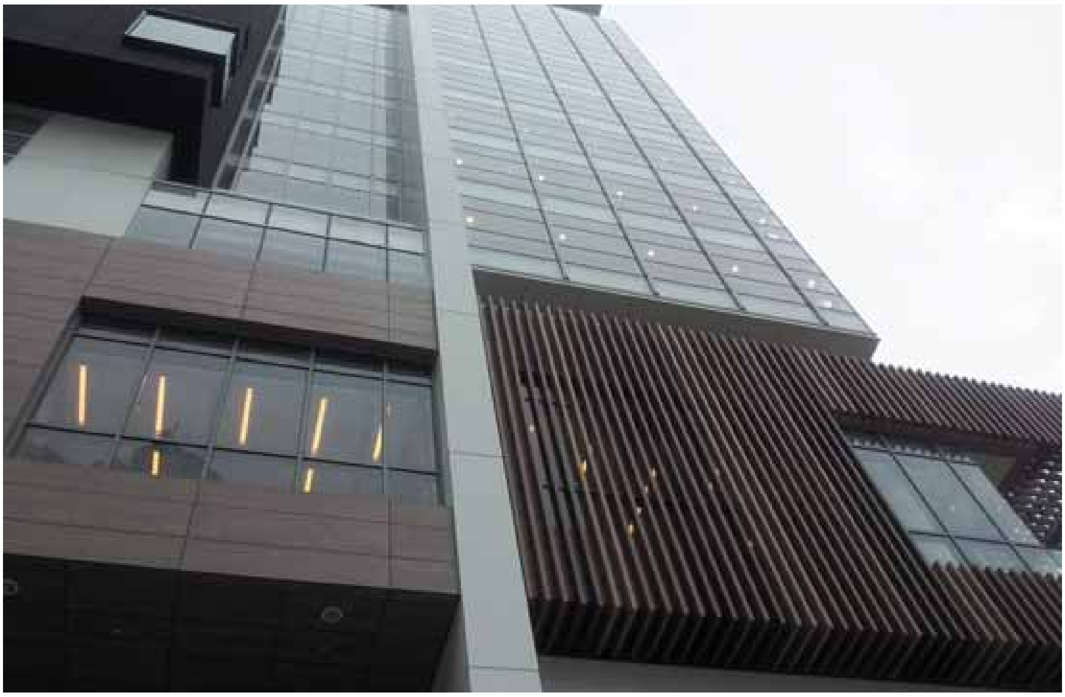
As a fire escalates, the amount of heat produced can grow quickly, spreading like a predator from one fuel source to another, devouring materials that, in turn, will produce gases that are both highly toxic and flammable. To make things worse, due to thermal expansion, these flammable gases are usually under pressure and able to pass through relatively small holes and gaps in ducts and walls, spreading the fire to other parts of the building. Heat will also be transmitted through internal walls by conduction.

As the fire worsens, and when unburned flammable gases reach auto ignition temperature, or are provided with an additional source of oxygen – for example, from a fractured window – an explosive effect called 'flashover' takes place. Flashover is the most feared phenomenon of any firefighter and signals several major changes in the fire and the response to it. First, it brings to an end all attempts at search and rescue in the area of the flashover. Simply, there will not be anybody alive to rescue.

Second, it signals that the fire has reached the end of its growth stage and that it is now fully developed as an inferno. That then signals a change in firefighting response because it marks the start of a worse danger – the risk of structural collapse. However, most fires, including the Bangladeshi examples, start with only a minimum of real danger – a dropped cigarette, a spark from a faulty wire – and, if dealt with quickly or adequately contained, pose no real threat.

The Global Landscape

The International Association for the Study of Insurance Economics (better known as the Geneva Association) says that – in the developed world –



the cost of fire has reduced over the past decade from 0.28% to 0.16% of GDP, and the risk of dying in a fire has fallen from an average of 1.88 to 1.34 per 100,000 of population. However, that declining trend masks some stark variables, even between developed countries. For example, Hong Kong – with a densely-packed population of over five million people – has fewer fire fatalities than many of the largest cities in the USA. Or Singapore, with a fire death ratio of 2.3 per one million of population, can be compared with Japan, which has a ratio of 16.0 – a risk factor several times greater. The worldwide average is 10.7 per one million of population, a league table topped by Finland on 18.0.

The main lesson from the Bangladeshi fires is that fire can spread with devastating speed, particularly in a large open space such as a supermarket, open-plan office or factory. And when it does get out of control, the best means of survival is escape.

Around the world, more stringent building and fire regulations have led to architectural and design teams taking a multi-disciplinary approach to assessing hazards – from power failure to cyber attack, from civil disorder to fire and explosive detonation – and arriving at risk assessments that, hopefully, illuminate how that building should be designed and built.

Designing in safety is nothing new, and starts with actively assessing the possible risks against that building's occupants, structure, resources and continuity of operations. There are a number of assessment methodologies to understand the potential threats, identify the assets to be protected, and how best to mitigate against those risks. That assessment then guides the design team in determining acceptable risks and the cost-effectiveness of the measures proposed.

HSBC Hong Kong

A good example is a recent project for HSBC Bank in Hong Kong, a commercially strategic HK$900 million financial data centre. This highly-sensitive building is HSBC's main data hub for the Asia-Pacific region, processing financial transactions from banking operations across some 30 countries and territories and handling a variety of functions, including personal and business Internet banking, securities trading, credit card, treasury and global payments.

The design team had to create a building that would balance interior spaces filled with natural light with an exterior envelope able to withstand a spectrum of meteorological and man-made threats – everything from bomb attack to a typhoon. So secure is the finished building that it was the first data centre in Hong Kong to meet the industry's most stringent reliability and security requirements, a reflection of the changing threat facing major companies and organisations, and the importance of protecting both the occupants of sensitive buildings and the integrity of their information systems.

Assessing risk is the starting point, and in particular the need to build in compartmentation throughout the building, examining the whole building's capacity to withstand a fire or other threats. For the glazed components, that should mean analysing the level of containment the glass will provide and its compatibility with its framing systems, because the safety of the glass cannot be assessed without its framing system. Put the right glass into the wrong frame, and you could be turning sixty minutes of fire-resistance into five minutes. In an evacuation situation where seconds count, getting the design wrong at the outset could be a costly – and deadly – mistake.

There are many types of fire-resistant glasses currently on the market – and the ranges of products and sizes will continue to increase as the technology for combining glass and glazing systems develops. We have come a long way to meet the evolving design requirements of architects and the increasing stringency of building and fire regulations. Simply, the glass and framing technologies now on the market mean that the impossible is now possible. APF

Lee Coates leads research, development and worldwide testing at Wrightstyle Limited

For further information, go to www.wrightstyle.co.uk

All shook up … virt earthquake disast

There is no doubt that training for the very worst case is a must for every emergency responder, yet for a substantial number of them proper and constant preparation remains an objective that is difficult to obtain for practical, logistical and financial reasons. There are however, new and innovative ways to prepare emergency responders of the 21st century in a cost effective, efficient and safe way.

Frank Dolmans

VSTEP

“Victims located at the corner of 25th and 3rd. All units proceed to location asap…” Moments after receiving the distress call a team of firefighters makes its way through the debris-ridden streets as the team proceeds to help the victims of the Force 8 earthquake that took the city by surprise several minutes earlier.

As they commence their search and rescue, they use tools like explosion and radiation meters as well as infrared cameras to locate victims and life forms below the collapsed buildings and roads. When a victim is uncovered, the medical response teams are alerted and apply triage status to the casualties they find. The ambulances and medical teams do not manage to get close to the located victims due to the destroyed roads, so the search needs to be continued on foot.

As the firefighters search they take care of any emerging fires, while the medical teams take care of the victims. At the same time the police keep an eye out for pillaging during the aftermath. Successful cooperation and maximum efficiency during incidents of any size requires optimal communication between all emergency services involved. The radio chatter is almost deafening and the tension is real as the different teams continue their missions and stick to the procedures, hoping an aftershock will not require them to change their carefully planned response strategy.

As we look at these emergency responders focusing on their tasks, we hardly realise we are looking at a virtual disaster training of an earthquake instead of the real thing. Virtual training is the latest innovation to prepare emergency responders for any thinkable incident and is a perfect enhancement and addition to the practical training. The RescueSim platform, for example, is a virtual incident management simulator created by Netherlands-based developer VSTEP, a provider of virtual training and simulation solutions.

In a virtual RescueSim training every emergency responder that participates looks through the eyes of his/her virtual self (a so-called avatar). They walk around in the virtual environment, communicate with other participants in the simulation and use virtual representations of their actual tools at an incident scene. The virtual training is instructor driven, this means an instructor creates an incident and will change parameters in real-time during the exercise, forcing the participants to adapt and change their response strategy during the incident.

For example, as the ambulance personnel proceeds with evacuating and triaging the victims, a tanker truck is leaning dangerously over the edge

ual training for er

of a broken bridge and dangerous liquid is spilling from a crack. The ambulance personnel alert the firefighters to take immediate action and they proceed to secure the area at once. The powerful instructor interface allows instructors and training coordinators to create any incident in advance in a matter of minutes and change almost all parameters "on the fly" during training. There is no time to linger for virtual training participants as the action is thick, stress levels are high and every action is monitored for post action debriefing.

Cristijn Sarvaas, VSTEP CEO explains that demand is rising for this new way of preparing. "Making it possible to train incident response at almost any time and in a completely safe and cost effective way is something a lot of emergency responders are interested in as work pressure rises and incidents become more and more complex," Sarvaas continues. Training can be done on basically any location as the simulator is easily set-up and portable, but it can also be integrated in a complete incident command suite and training chamber, depending on the client's needs. The training itself can also be tailored to the needs of the customer.

For the above earthquake training example, VSTEP received a request from the Chinese city of Chengdu in the Sichuan province, which itself was the epicentre of a major earthquake in 2008, resulting in great loss of life and infrastructural damage. The Chengdu Emergency Services was already using RescueSim for incident training and preparation, and it approached VSTEP to enhance RescueSim with specific earthquake disaster training. Major parts of Chengdu were recreated in 3D to allow the emergency services training in its actual environment and adapt the RescueSim platform for the Chinese emergency services.

The result is a virtual platform that will allow the emergency services to train and prepare response strategies for earthquakes in the region. The new earthquake training is the latest addition to the RescueSim natural disasters library, which incorporates response training for disasters like floods, storms, forest fires and other natural disasters. Next to natural disasters, almost any incident can be trained, ranging from a full scale air crash, offshore disaster and industrial incident to a simple traffic accident, tunnel incident or building evacuation.

RescueSim currently includes 130 virtual incident locations in which safety and security professionals can build their rescue skills and practice alternative response strategies in a safe, low-cost environment. The Chengdu authorities are building a high-technology simulation centre that will act as the central hub for the use of innovative technology in emergency management and response in South East Asia.

Chengdu may act as a pioneer in Asia, but virtual emergency response training is currently used by emergency responders worldwide, and the increasing awareness that virtual training has many advantages to enhance the training curriculum ensures the growth will likely continue for some time to come. "Functionality and training outcome are closely linked and are always key to any simulator, " Sarvaas adds. "RescueSim has been under constant development for seven years and we have always worked very closely with the emergency services and target groups the simulator was meant for, using their expertise to create and incorporate all required functionality and features to guarantee a realistic experience. In the end it is about saving lives!" APF

Frank Dolmans is Chief Marketing Officer at VSTEP B.V.

For further information, go to www.rescuesim.com

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G-Force Nozzles: The Inside Story

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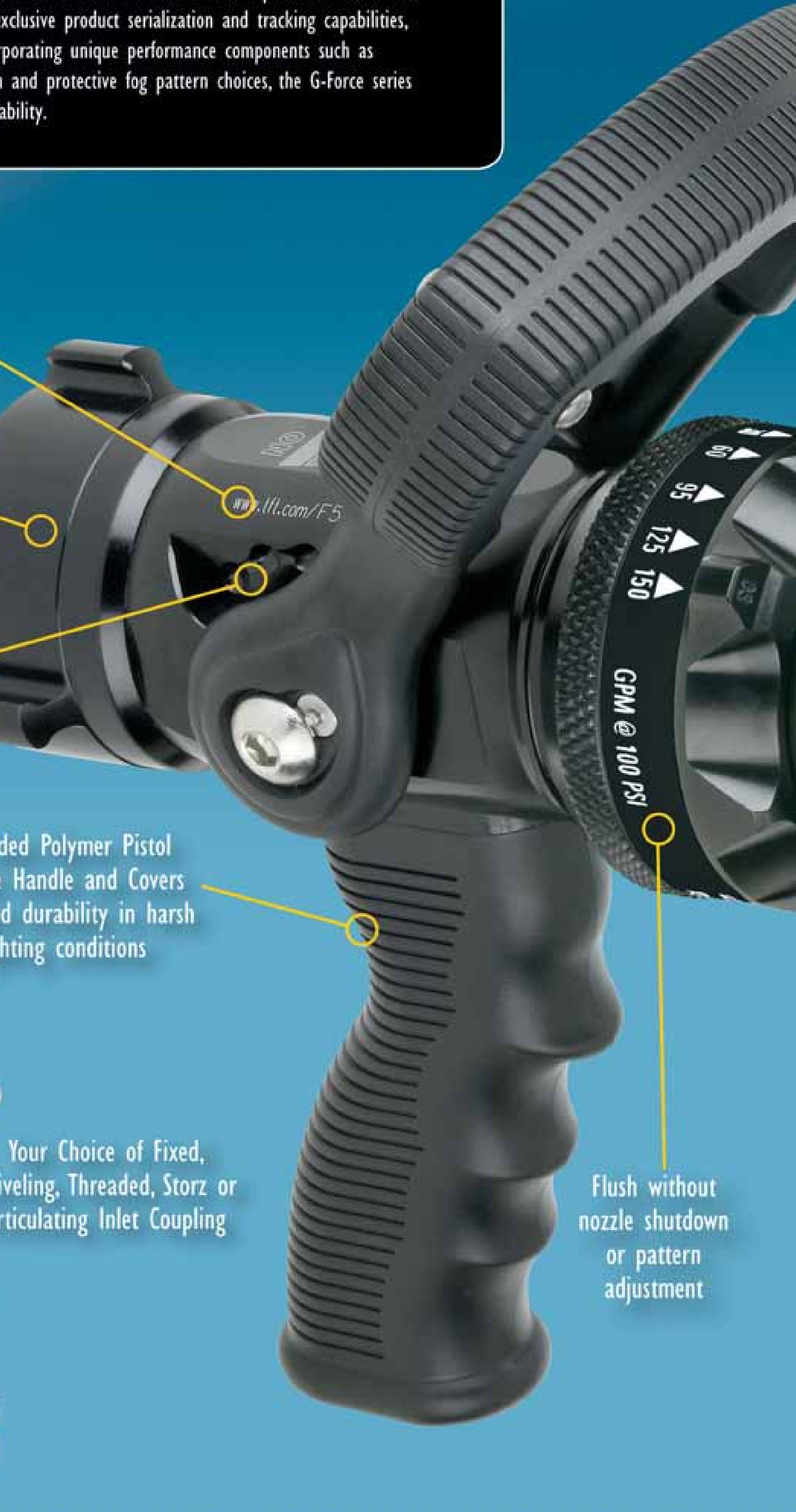

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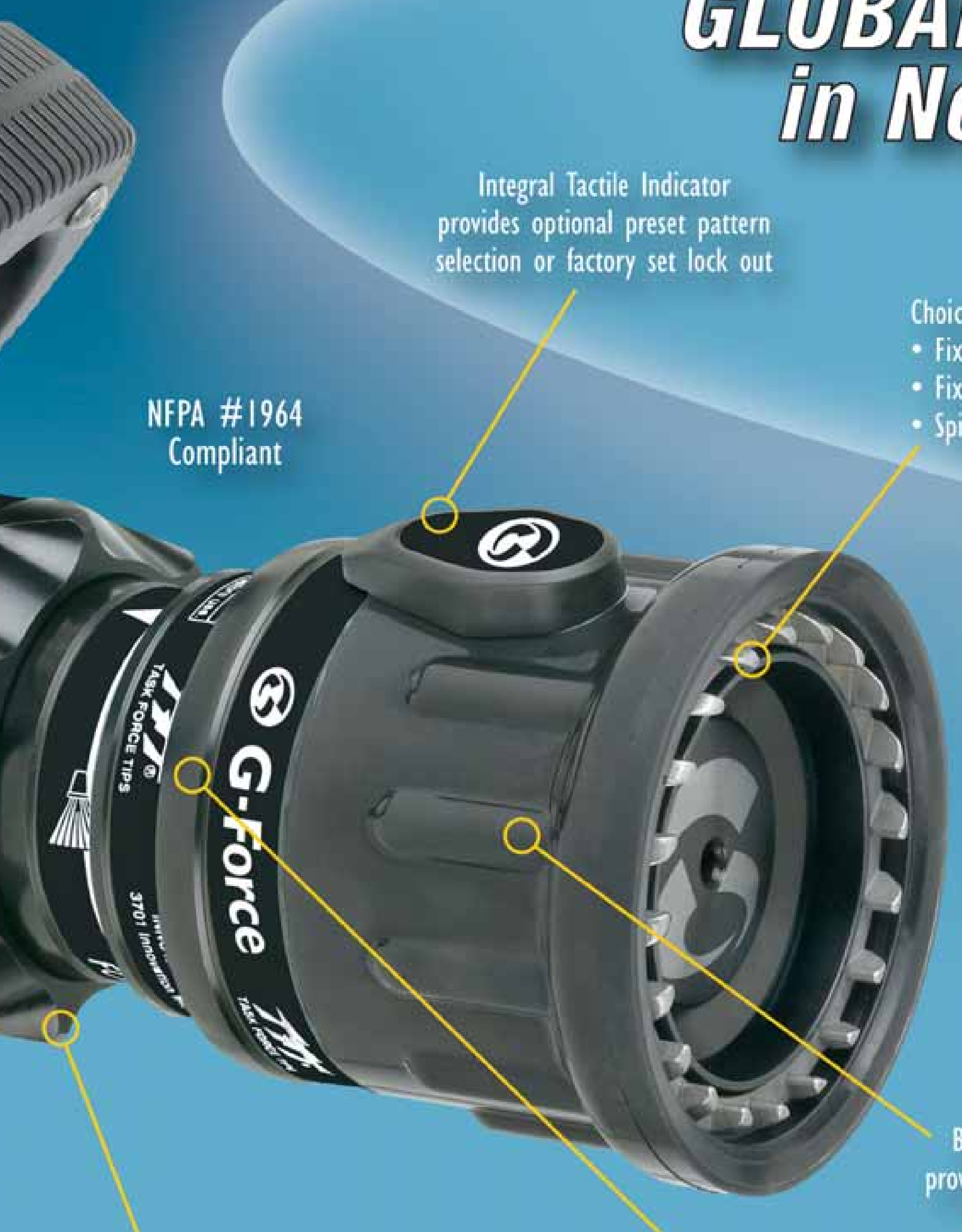

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Two firemen are extinguishing a vehicle fire with foam after an accident. Picture from iStockphoto

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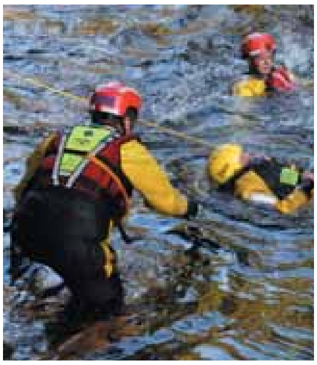
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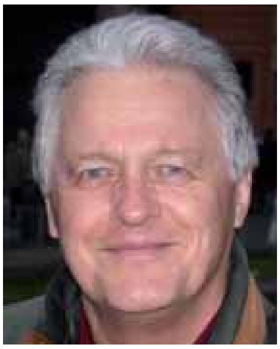

By Graham Collins

The Critical Decade

The recently published reports by Australia's Climate Commission and The Intergovernmental Panel on Climate Change make sobering reading, reinforcing the message that the fire and rescue services may have to be ready to face major emergencies in the years to come.

The Climate Commission was set up to provide the Australian population with an independent and reliable source of information about, among other things, the science of climate change. It comprises experts from a range of specialisations that are relevant to climate change; the organization is not subject to Government direction. Its recently published report entitled *"The Climate Debate"* points out in no uncertain terms that*:* "Failing to take sufficient action today (on the climate) entails potentially huge risks to our economy, society and way of life into the future."

Among the points the report highlights is the fact that in the past 50 years the number of record hot days in Australia has more than doubled, increasing the risk of heat-waves and associated deaths, as well as extreme bush fire weather, particularly in south-eastern and south-western Australia. It also points out that the sea level has risen by 20cm globally since the late 1800s, impacting many coastal communities, and includes the dire warning that another 20cm increase by 2050 – which is feasible at current projections – would more than double the risk of coastal flooding.

To make matters worse, sea levels along the west coast of Australia have been rising at more than double the global average. So, with more than four-fifths of the Australian population living in coastal cities and towns – Australia is one of the world's most urbanised countries –rising sea levels pose significant risks to Western Australia's coastal infrastructure and iconic sandy beaches and exacerbate the already present vulnerability of coastal towns.

The report also concludes that higher temperatures will increase the likelihood of large and intense fires, while changing rainfall patterns and the risk of more intense rainfall events pose challenges for low-lying urban centres on the south coast of New South Wales and South Australia.

Hardly surprising then that the respected authors of the Climate Commission's report give the dire warning that: "This is the critical decade for action. The choices we make between now and 2020 will shape our future."

In case any non-Australian readers of this edition of *Asia Pacific Fire* feel inclined to breathe a sigh of relief, I recommend they also take a close look at The Intergovernmental Panel on Climate Change's special report, *"Managing the Risks of Extreme Events and Disasters to Advance Climate Change."* The Panel was established by the United Nations Environment Programme (UNEP) and the World Meteorological Organization (WMO) and thousands of scientists from all over the world contribute to its work. The picture the special report paints suggests that all countries in the Asia Pacific region face the prospect of a similar harrowing future.

Clearly, it is no longer acceptable to hope for the best. We also need to be wary of relying on short-term measures such as improvements in levees that potentially encourage further development in flood plains.

The implications of both reports are massive in terms of adapting to these environmental changes, particularly for : disaster mitigation; managing the risks; emergency response planning; educating the public; developing and enforcing building codes and town planning restrictions; post-disaster recovery; and, of course, fire and rescue service manning levels, training and resources.

Politicians, and those responsible for setting budgets for services upon which our very way of life may soon depend, please take note. **APF**

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Lorraine Carli

NFPA

NFPA & Legoland Form Fire Prevention & Safety Partnership

What do you get when you combine the age-old love of building with plastic bricks and children's fascination with firefighters and fire trucks? For NFPA the answer was easy. You get a great opportunity to share important fire safety messages with millions of international visitors in a fun and entertaining way at Legoland Florida, a new addition to the amusement park landscape in the United States.

Legoland Florida opened in October in Winter Haven, 45 minutes from both Orlando and Tampa. The 150-acre interactive theme park is designed for families with children between the ages of two and 12, and includes more than 50 rides, shows, and attractions. One of those shows is "The Big Test," where a handful of eager but hapless characters are put through a test — administered by the show's straight man, Chief Stern — to see if they have the right stuff to become volunteer firefighters. While the show's approach is slapstick — it features a lot of acrobatic comedy and hysterical antics, and audience members may find themselves on the wrong end of a stream of water — there are nevertheless important fire safety messages imparted along the way.

That's why NFPA has joined Legoland Florida for a long-term fire prevention and safety partnership. At a press event and fire safety day at the park earlier this year, NFPA became the official sponsor of "The Big Test." The show runs four times a day at the Lego City Stage and will be seen by thousands of kids and families during the life of this partnership. Visitors to the show will also have a chance to send someone an e-postcard safety message by scanning a special QR code as they exit the theatre. This provides an additional way to further spread the life-saving messages they have just heard onstage.

Given the on-going barrage of messages and media, it is increasingly difficult these days to reach children and families with safety messages. As NFPA continually looks for creative ways to break through the clutter with lifesaving information, the Legoland Florida opportunity is a good fit. As I sat in the audience for a preview of the show earlier this year, it made sense to me. Kids laughed at the antics and dodged buckets full of water, but they were also able to correctly answer Chief Stern's questions about what to do if there was a fire in their home.

To jump-start the partnership, NFPA, with the help of the Winter Haven Fire Department and other area firefighters, put together learning stations throughout the kick-off day that promoted "The Big Test" and reminded families to have working smoke alarms and a home escape plan.

In addition to "The Big Test" sponsorship and messaging, NFPA will work with Legoland Florida throughout the year to share fire safety information. There will be a particular emphasis during October as part of Fire Prevention Week activities.

NFPA and Legoland Florida also wanted to acknowledge others who play a role in making the world safer from fire, so the partnership includes park discounts that will be available throughout the duration of the partnership for NFPA members and friends as well as firefighters.

For anyone planning a trip to Orlando, especially with children, Legoland offers a fun-filled day of Lego brick-themed rides, exhibits and entertainment. Visitors to the "The Big Test" show will be amused by the characters and their antics while getting a refresher on key fire safety information. For more information on the NFPA/ Legoland Florida partnership and discount programs, visit nfpa.org/legoland. APF

Lorraine Carli is NFPA Vice President Communications

For further information, go to www.nfpa.com

For Emergency Management, Go West!

AFAC & BUSHFIRE CRC Annual Conference, this year entitled "*Diverse country. Common ground*", is being held at the Perth Convention and Exhibition Centre in Western Australia between the 28th and 31st August. Now in its 19th year, around 1000 delegates are expected to attend what is widely regarded to be the leading emergency management, all-hazards conference in the Australasia/Pacific region. It attracts senior practitioners, industry experts, researchers and senior emergency management personnel from around the region.

According to Naomi Brown, CEO of Australasian Fire and Emergency Service Authorities Council (AFAC), the annual conference is the keystone event in the knowledge-sharing program for AFAC. The theme of the conference this year, "*Diverse county. Common ground*", reflects the challenges and trials facing everyone in fire and emergency services in a region with diverse topography, climate and population density.

Key activities include: a one-day, all hazards, research forum; a two-day conference; gala dinner; eight professional development events; and four field trips.

Leading national and international experts, researchers and emergency management practitioners will share their experience and expertise across themes that include: understanding the drivers shaping emergency management; how diversity and resilience shape community expectations; youth and volunteering into the future; and learning about risks in different environments (natural, built, marine). Other themes will be: understanding the importance of leadership and accountability in incident management; and the latest research from leading researchers and how it is implemented into policy and practice.

For more information, go to www.afac2012.org

Range Offers More Sound Options

APOLLO FIRE DETECTORS has added an open-area voice sounder and sounder beacon to its Discovery voice product range. Designed to provide clear instructional messages within a fire system, these latest enhancements offer six distinct messages and seven volume levels. Apollo says that the devices can be used in applications to ease confusion for the public, instructing them in a concise and intelligible manner on what emergency action should be taken in case of a fire.

Both products offer high volume and enhanced capability of up to 15 tone/message pairs, which reduces the risk of audible alarms being ignored. Both products operate only with the Discovery protocol.

For more information, go to www.apollo-fire.co.uk

Power Unit Adds Mobility

LUKAS has added a new power unit to its hose-connected rescue tool offering. Called the Compact Pump P 600 OE, it can be driven by either electric power from a constant current generator or a rechargeable Li Ion battery. This power unit is aimed at increasing the mobility of conventional rescue tools; it is compact, quiet, weighs less than 10 kilogrammes. It also has a energy management system that is said to guarantee long running times.

For more information, go to www.lukas.com

Dräger UCF 6000, UCF 7000, & UCF 9000:

A New Generation of Thermal Imaging Cameras

The UCF 6000, UCF 7000, and UCF 9000 include both a number of impressive new features and intuitive operation. The UCF 7000 and UCF 9000 are the first Dräger thermal imaging cameras with ATEX and UL approval. This means that they can now also be used in potentially explosive atmospheres.

Dräger thermal imaging cameras ensure vital orientation for the firefighter in fire, smoke or dark environments, making fighting fires significantly less hazardous. These new devices help firefighters optimally manage the various challenges they are faced with, such as sizing up the fire they are confronted with or searching and rescuing injured people. The cameras generate images of objects or bodies whose thermal radiation is invisible to the human eye. They cover an extended temperature range of –40°C to 1000°C.

Innovative Functions for a Broad Range of Applications

The concept and design of the new camera offering enables operation of all of the functions with just one hand. In addition, the light weight of just 1.3kg together with various carrying options makes transportation and use of the new thermal imaging cameras even easier. If the hazard situation requires it, the operating mode can quickly be changed and adapted to the new situation by pressing a single button. The user has a choice of up to eight additional settings; for example, "Thermal Scan" for finding fire pockets during overhaul operations.

The UCF thermal imaging cameras are also equipped with an integrated laser pointer that enables the team members to communicate effectively and warn each other of potential dangers.

Clear and Sharp Images

The UCF 6000 and UCF 7000 offer an image resolution of 160 pixels by 120 pixels, while the UCF 9000 offers 384 pixels by 288 pixels. In addition, the UCF 7000 and UCF 9000 also have a 2x and 4x zoom function that ensures rescue workers remain safe when approaching the danger area.

If the situation is unclear or visibility is limited, the new UCF thermal imaging cameras enable the user to "freeze" the image on the display as a way to view hard-to-reach places, such as when looking around a corner. The image can then be shared with other firefighters, as long as the trigger button remains pressed. For documentation and training purposes, the UCF 7000 and UCF 9000 offer a video and sound recording function as well as an option to record individual images.

The robust UCF thermal imaging cameras have passed the flame test in accordance with EN137:2006 and are protected against the ingress of dust and water to IP 67. The construction and circuitry of the UCF 7000 and UCF 9000 have been designed in such a way that the cameras cannot become a source of ignition. They are therefore intrinsically safe and approved for use in potentially explosive atmospheres, including zone 1, in accordance with ATEX directive 94/9/EC and UL-approved Class 1Division 2. APF

For more information, go to
www.draeger.com

Ready for Action Combi-tool

LUKAS is promoting its lightweight SC250E combi-tool as the ideal hydraulic tool for applications where casualties are hard to reach, such as in narrow tunnels or natural disasters, or where every gram of weight counts when transporting rescue equipment. The SC250E is ready for action at the press of a button, and rescues can be carried out with complete freedom of movement, without the need for power units and hoses. It enables cutting and spreading to be achieved without changing tools, spreading even the narrowest openings with the flat tip to free injured people.

Boasting short opening and closing times, the SC250E is being promoted as being particularly suited for use on advance-construction vehicles, motorcycles and helicopters. Like the larger SC350E, the smaller, lighter SC250E is equipped with the proven star grip control for simple and intuitive operation. It offers a cutting force of up to 280 kN and a spreading force of up to 405 kN; a spreading distance of 318 mm, a pulling force up to 32 kN, and a pulling distance of 330 mm.

For more information, go to www.lukas.com

1000th Panther Delivered

Rosenbauer has built and delivered its 1000th Panther ARFF truck.

The Panther series incorporates trucks with two, three and four-axle chassis, permanent all-wheel drive, engine capacities of 500hp to 1,260hp and tanks with volumes of 6,000 litres to 19,000 litres. A difference of four meters and over thirty tonnes separates the Panther 4x4 ATA, which is the smallest version and suitable for air transport, and the Panther 8x8 CA7 with long wheelbase, which is the largest model in the current line-up.

To date, the Rosenbauer flagship fire truck has been utilised in 81 countries and, according to Rosenbauer, is the most frequently employed ARFF vehicle at international airports. The top markets for the Panther include India, Australia, China, and Japan.

Rosenbauer delivered its first ARFF vehicles in the mid-1950s, followed in the 1960s by large airport pumpers carrying several thousand litres of extinguishing agent. With the arrival of the first Boeing 747 jumbo jet in the 1970s, airport fire trucks increased in size and, in 1984,Rosenbauer unveiled the SIMBA 8x8, which to date is the company's largest and most powerful vehicle.

For more information, go to www.rosenbauer.com

New Foam-induction Water Monitor complements Range

ANGUS FIRE has launched Polaris, a foam-induction water motor to complement its existing range of foam-making equipment. It is designed to deliver 1%, 3%, 6% or dual-rate foam induction within Underwriters Laboratory (UL), Factory Mutual (FM) and EN standard limits, across a wide range of flows and pressures.

The water motor is driven solely by the extinguishing water flow, requiring no external energy source. The water flow drives a rotor connected to a foam pump, which pumps foam concentrate into the water motor outlet, creating the firefighting water/foam solution. The system is flow-proportional – the higher the water flow, the more foam is inducted, to maintain the correct concentration level.

Major benefits being claimed for Polaris include minimum water and line pressure loss. Foam concentrate can be supplied from a tank at atmospheric pressure, which can be refilled at any time without any need to interrupt firefighting activities. Polaris is manufactured from high-grade, corrosion-resistant materials that are compatible with seawater, ensuring that it can be used in a wide range of environments, including offshore and marine installations. Polaris induction motors are designed to match normal water flow through a schedule 40 pipe system, and can be configured for static industrial systems and ring mains, including foam sprinkler systems. A de-mountable, portable version of the unit is available, which is suitable for use on fire and rescue vehicles.

For more information, go to www.angusfire.co.uk

Hainsworth® TITAN Proves a Hit with ACT Firefighters

New kit worn by the Australian Capital Territory Fire & Rescue includes innovative fabric supplied by leading British textile manufacturer Hainsworth.

The personal protective equipment worn by ACT firefighters will incorporate Hainsworth® TITAN following a successful trial in conjunction with Australian garment manufacturing partner Stewart & Heaton.

The ACT Fire & Rescue service decided to change its structural kit as part of a new ensemble approach. The kit, which will be worn by more than 400 firefighters, will continue to be lime green in colour to improve visibility.

Charlotte Brandt, Sales Manager for Hainsworth Protectives, says: "ACT was keen to utilise all the benefits associated with Hainsworth® TITAN together with the use of a Gore Airlock moisture/thermal barrier and Nomex® filament inner liner. She continues: "The decision to proceed was made only after excellent performance results achieved through bench top testing to the AS/NZS 4967:2009 Standard."

Hainsworth® TITAN is a patented double-cloth construction with Nomex® on the face to provide optimal thermal protection, abrasion resistance and colour fastness, and Kevlar® on the back to provide strength. The kits offer exceptional heat stress management capabilities as well as comfort, wear life and durability, heat and flame protection and chemical resistance.

The company, which is based in Yorkshire, England, believes that its combination of fibre, weaving and finishing technologies offer firefighters the ultimate in high performance fabrics. Charlotte Brandt adds: "Our ACT success is the result of all the hard work put in by the Hainsworth team in continually innovating and developing the best possible protective fabrics for today's firefighters. We place a huge amount of emphasis on providing fire services with fabric solutions that combat heat stress – the biggest cause of firefighter injury and death worldwide – minimise the impact of UV degradation and ensure maximum durability and breathability."

She points out: "Today's kit has to perform many duties to protect the modern firefighter, which are often at odds with each other. It must stop water and heat from outside the garment getting through to the wearer while allowing water (sweat in the form of moisture vapour) and heat from the wearer to dissipate to the outside. It must be robust enough to offer high levels of thermal and mechanical protection while also being light and breathable enough to minimise heat stress."

Hainsworth Protectives promotes three core messages to potential customers around the world: Design that Saves; Protection that Shows; and Quality that Lasts.

ACT Fire & Rescue is the latest fire service to use Hainsworth® TITAN. Apart from Australia, firefighters in the UK, United States, Saudi Arabia, Bahrain, Scandinavia and Central Europe all use the fabric.

Hainsworth, which is based in Yorkshire, England, has over 225 years of textile expertise and has been at the forefront of protective fabric innovation for more than 100 years, working with the emergency services and the military. APF

For more information, go to
www.protectivefabrics.com

OCV Deluge Valves Can Take the Heat

OCV Control Valves has been manufacturing world-class fire protection control valves for over 60 years and has established a reputation for quality, customer service and engineering expertise. OCV manufactures a variety of valves that perform different tasks in fire protection systems, including fire pump relief, pump suction control, pressure reducing, deluge, thermal expansion pressure relief, altitude control and water storage/level control.

OCV's valves are designed to perform numerous functions, and can be custom-built to any specification or application. In addition to model specific advantages, each OCV fire protection valve has the following features:

- Operates automatically off-line pressure.
- Throttling seat retainer for flow and pressure stability.
- Diaphragm assembly guided top and bottom.
- Heavy duty nylon reinforced diaphragm.
- Rectangular-shaped, soft seat provides drip tight class VI closure.
- Easily maintained without removal from the line.
- Diaphragm replaced without removal of internal stem assembly.
- Replaceable seat ring.
- Alignment pins ensure proper reassembly after maintenance.
- Valves are factory tested, serial numbered and registered.

Deluge control valves are designed to deliver large quantities of water over a large area in a relatively short period of time. In a fire protection system, a deluge valve is a normally closed valve, opened by a trigger or loss of pressure in a pilot line to supply water to the fire protection system.

OCV Control Valves offers many different deluge valves, depending on the application. The basic UL-approved deluge valve, the model 65FC, is a normally closed valve, which automatically opens to admit water through the main line when the bonnet pressure is released, and closes when the bonnet is pressurised. The 65FC can operate via an electric solenoid, pilot or manual activation.

The OCV series 116FC deluge valves automatically open to admit water through the main line when the pneumatic supply pressure is removed and close when the pneumatic pressure returns. The 116FC valves also include a manual override, are pilot operated and have a visual indicator for easy assessment of valve position. The 116-3FC can function off pneumatic supply or a solenoid signal while the 116-4FC operates via a solenoid signal. All of the 116FC, 116-3FC and 116-4FC models are UL listed.

OCV also offers non-listed deluge valves for applications that require size or component conditions outside of the UL-listed range. The model 115-1DV deluge valve opens automatically to admit water through the main line when the three-way solenoid is activated. This deluge valve is commonly used in both fresh water and seawater applications. The model 115-4DV operates the same way, but also has an accelerator pilot to speed up valve opening and closing and is principally used in seawater applications.

The OCV model 139 deluge valve quickly floods an endangered area with water in the event of a fire. Although adaptable to other installations, the 139 is designed for the marine environment of off-shore petroleum drilling and protection platforms. It is a single seated, hydraulically operated, direct acting, diaphragm actuated globe valve that is powered by line pressure and controlled by isolated upper and lower diaphragm chambers.

Many OCV deluge valves are used in corrosive sea water environments. Material selection for these applications is imperative to assure proper performance and long valve life. OCV Control Valves has a long history of applying valves in corrosive seawater environments and offers many options in materials and special coatings.

Only OCV Control Valves offers the complete package: custom made-to-order valves, engineering expertise, quality that is registered to ISO 9001:2008 and excellent customer service. **APF**

For more information, go to
www.controlvalves.com

283.5

In today's business climate, we believe a company should be held accountable by more than just regulations and government entities. At OCV, we answer to you-the customer-and you expect a high standard, demand solutions that work, and insist on products of quality.

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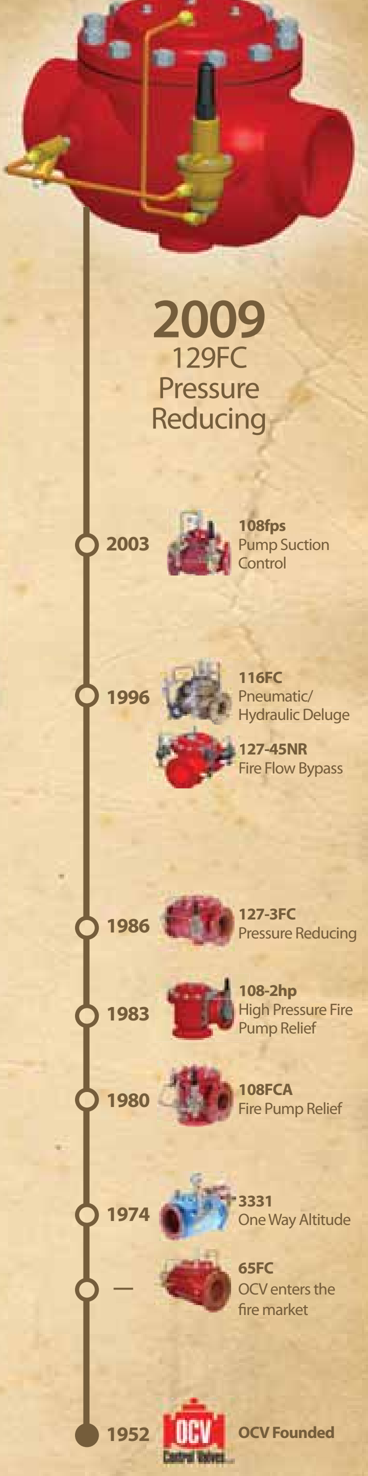

2009
129FC
Pressure
Reducing

2003 **108fps**
Pump Suction
Control

1996 **116FC**
Pneumatic/
Hydraulic Deluge

127-45NR
Fire Flow Bypass

1986 **127-3FC**
Pressure Reducing

1983 **108-2hp**
High Pressure Fire
Pump Relief

1980 **108FCA**
Fire Pump Relief

1974 **3331**
One Way Altitude

— **65FC**
OCV enters the
fire market

1952 **OCV Founded**

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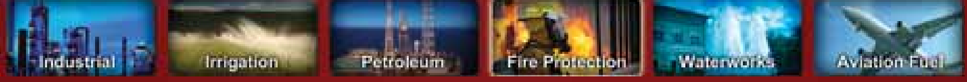

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Wireless Gas Detection for Hazardous Environments

To solve what it sees as the challenge of keeping gas detection systems constantly powered when conducting remote exploration operations and working in hazardous and rugged environments, RAE SYSTEMS has introduced SolarPak, an intrinsically safe, stand-alone 24/7 remote solar powered solution for wireless gas detection systems.

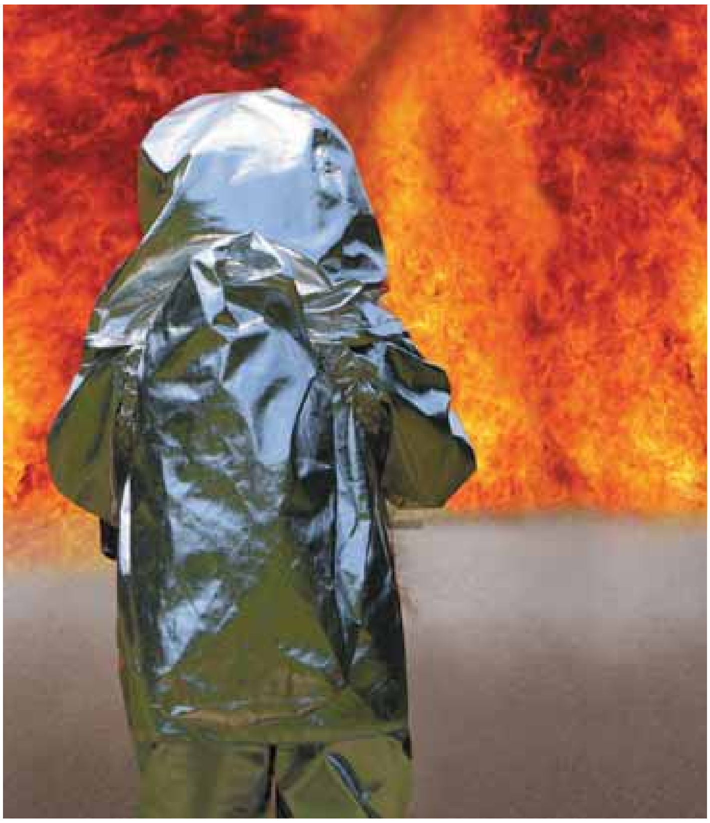
SolarPak complements RAE Systems' PowerPak by delivering an uninterrupted power supply that enables its MeshGuard Gas Detection Systems to monitor gas in remote exploration sites 24/7 – particularly in areas where flammable gases or vapours present a health or safety threat.

It is claimed to be the only solar solution certified for Class I, division I (ATEX Zone 0) hazardous locations, and is compatible with all RAE Systems MeshGuard wireless gas detectors and Mesh Routers. SolarPak features an integrated solar panel and charge controller to charge the RAE PowerPak external battery, which enables continuous operation of gas detection systems. The solution is claimed to dramatically reduce labour and maintenance costs by eliminating the need for expensive trenching and cabling or periodic changing of batteries.

RAE Systems' MeshGuard wireless gas detection system is a battery operated, rapidly deployable hazardous area monitoring system that combines advanced gas-detection technology with the latest in wirelessly connected data systems. Its rugged design delivers reliable performance in harsh and potentially hazardous industrial environments, such as oil refineries, oil and gas exploration, oil and gas production, and tank farms. A complete MeshGuard gas detection system can be deployed in minutes, and will operate continuously – even in cloudy conditions – with the RAE PowerPak and SolarPak. The standard pole and wall mount adjust easily to maximise energy production at different geographic locations.

For more information, go to www.raesystems.com

New Fabric System Unveiled



NEWTEX INDUSTRIES has introduced Z-Flex Silver, describing it as "a revolutionary new multilayer aluminised fabric system" to contend with today's fires that are burning hotter, for longer and can give off heat in excess of 1650°C, particularly in airport crash and rescue, petrochemical and hazmat emergencies.

Z-Flex Silver is claimed to be the most advanced aluminised outer shell system ever developed that combines Z-Flex multilayer aluminisation technology with a 3D Mock Knit fabric featuring PBI flame resistant fibres. This integrated outer shell system is said to offer superior protection and performance for the next generation of aluminised personal protection equipment. It is a five-layer outer shell composite that has been engineered to provide durable, comfortable and superior protection from high energy, radiant heat. By reflecting back the heat, Z-Flex Silver allows close flame proximity while reducing the rate of heat absorption that can lead to thermal fatigue.

The Z-Flex multilayer aluminisation process employs thin film vapour deposition technology to apply very fine, highly reflective aluminium particles to both sides of a high temperature polymer film barrier. Z-Flex films are designed to reflect up to 95 percent of radiant heat, with zero flame or afterglow even when exposed to direct flame. The resulting Z-Flex film is then chemically and mechanically bonded to the 3D Mock Knit fabric utilising the latest advancements in bonding technology. This three-dimensional Mock-Knit fabric is woven with high performance PBI fibres and reinforced with filament Para-Aramid for unrivalled protection and strength.

For more information, go to www.newtex.com

TetraKO Earns "Design for the Environment" Recognition

TetraKO, LLC, the fire suppression subsidiary of EarthClean Corporation, has earned recognition under the U.S. Environmental Protection Agency's (EPA's) Design for the Environment (DfE) program for its TetraKO biodegradable water enhancer.

TetraKO is the first fire suppression product to earn EPA's DfE recognition under the new Industrial/Institutional product category "Fire Fighting Product", satisfying the need for a highly effective and environmentally safe fire suppression alternative. TetraKO is a corn-starch-based water enhancer that transforms ordinary water into an adhering gel that is dramatically more effective at attacking, suppressing, and containing fires.

When you see the DfE label on a product, it means that EPA's scientific review team has evaluated every ingredient for potential human health and environmental effects and allowed only chemicals from the safest in their class – that meet stringent EPA criteria – to be used. DfE-labelled products do not contain known chemicals of potential concern, like carcinogens, reproductive or developmental toxicants – and even minor product components, like dyes and fragrances, are screened for safety.

After a year of technical information exchange about TetraKO agriculturally-based fire suppression/extinguishment technology, a Partnership Agreement has been executed between EarthClean Corporation and the EPA's DfE Program. This is the first fire suppression/extinguishment product to be accepted under this category, and will now be listed on the DfE website.

"One of our first priorities was to test TetraKO for its health and environmental impacts. This first-ever EPA DfE certification is further confirmation of this product as a safe and effective alternative for fire suppression," says Doug Ruth, TetraKO, LLC CEO. "We believe TetraKO has the potential to transform fire suppression technology. We are testing TetraKO with municipal fire departments, where it has proven effective in structural and car fires, as well as on wildfires."

In collaboration with the EPA's DfE program, EarthClean formulated TetraKO, a Class-A firefighting water enhancer that offers safer health and environmental characteristics, when compared with other firefighting chemistries. The TetraKO Qualifying Product contains no halogenated organics, inorganic phosphates, or hazardous solvents. Instead, EarthClean uses a proprietary blend of ingredients, much of which are agriculturally-based, that exhibit more positive environmental and human health characteristics than conventional fire-fighting formulations.

A main element of the partnership between EarthClean and the EPA's DfE program provides EarthClean the opportunity to work with EPA chemists and environmental scientists in investigating materials to further improve the health and environmental profile of its TetraKO Qualified Product. EarthClean agrees to make continuous environmental improvement an important activity in its R&D activities.

DfE-labelled TetraKO offers the following benefits:

- **Environmental Protection**
  TetraKO is formulated with the environment and human health strongly in mind. It contains components with a more positive environmental profile than conventional Class-A fire fighting products.
- **Worker/Consumer Safety**
  It is formulated to help ensure a safer workplace. Users of TetraKO benefit from ingredients that include no components that pose serious health hazards. This benefit is amplified for firefighters, forest service workers and others who must use fire-fighting products on a regular basis.
- **Resource Conservation**
  TetraKO has certain attributes that may significantly reduce use of water and decrease overall fire damage, due to its enhanced firefighting performance.
- **Customer Education**
  EarthClean acts as a product steward by providing its customers with information on environmental and worker safety matters, and trains its sales force on the benefits of formulations with improved environmental and health characteristics. APF

For more information, go to
www.tetraKO.com

XPander

– Tried & Tested Radio Technology from Apollo

Fire detection systems in industrial and commercial applications have traditionally used hard-wired installations. These systems are generally installed at the time of construction or refurbishment, making the laying of cables less of an issue. However, certain applications do not lend themselves to this approach.

For example, it can be very difficult to introduce cable runs into buildings that are not designed for the modern age. It may also be that a collection of buildings, such as an open air museum, requires fire protection, but is not suitable for normal wired systems. It is for buildings of this kind that Apollo Fire Detectors Ltd has developed its wireless XPander product.

Designed for use in areas where hard-wired fire detection is impossible or impractical, XPander devices provide an ideal solution in applications such as occupied buildings, heritage sites and buildings, palaces, annexes and temporary structures. All of these building types are likely to have strict rules regarding alteration to the original fabric of the structure, or would be negatively affected by the impact and inconvenience of re-wiring work or installing traditional fire systems. In these circumstances, channelling and wiring for traditional fire detection could cause damage to interiors as well as disruption for building users during installation.

XPander devices can be found in The Royal Albert Hall (London), Marianske Lazne Theatre (Czech Republic) and The Guildhall (Portsmouth), to name but a few.

Buildings that are undergoing fire system refurbishment can also benefit from wireless devices. In this instance, wireless fire detectors can be used to provide temporary cover until the old fire system is decommissioned and a new hard-wired fire system can be installed.

Wireless technology offers a number of benefits over traditional hard-wired systems: the installation process is greatly simplified, costs associated with potential damage to buildings are lower, the risk of business disruption is reduced and the technology is flexible, adaptable and cost-effective. What is more, the technology can provide protection to any building type, layout or structure.

Why XPander?

Apollo's XPander solution incorporates individual detectors, call points, interfaces and alarm devices in one system that communicates with the Apollo analogue addressable loop by radio signals.

The range includes an optical smoke detector, multi-sensor detector, heat detector, sounder and sounder beacon and a wireless manual call point. Site surveys will enable installers to determine the most appropriate system design and, with this in mind, Apollo has developed an XPander survey tool. Purchasing this tool equips the installer with the necessary equipment to carry out an accurate site survey.

Each XPander device is assigned an XP95 address and a loop-powered XPander interface controls up to 31 XPander devices. The XP95 address is recognised by the control panel in the same way as other XP95 devices connected directly to the loop wiring. Up to five XPander interfaces can be installed on each site and where more than five interfaces are required for each site, Apollo can advise on the most appropriate solution.

The XPander range benefits from the patented XPERT technology that is also used in Apollo's Discovery and XP95 ranges. The innovative product has been certified to a number of worldwide approvals. Furthermore, the entire range is approved to EN54-25, which is the industry standard for radio equipment used in fire safety areas.

Apollo offers a free one day training course on XPander, details of which can be found at www.apollo-fire.co.uk/training.

Key Features of XPander Include:

- Made in the UK.
- Protected by Apollo's Product Lifetime Guarantee.
- Easy to install.
- XPERT card addressing.
- Proven technology.
- No special control panel needed.
- 868MHz radio signalling.
- Up to 31 devices for each interface.
- Up to five interfaces for each site. APF

For more information, go to www.apollo-fire.co.uk/XPander

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We are the world's largest independent smoke detector manufacturer offering unrivalled choice and giving customers the flexibility to choose solutions that fit their unique needs.

Our entire range, certified to key international standards, offers a 10 year product guarantee and we are proud to have trusted partnerships with more than 70 panel manufacturers. Apollo offers open digital protocol and forwards and backwards compatibility, giving customers complete freedom to choose a solution that's right for them.

To find out more visit: **www.apollo-fire.co.uk**

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apollo
WORLD CLASS FIRE SOLUTIONS

New Hydraulic Hard Sleeve System

ZICO (Ziamatic Corporation) has introduces the Model HS-HA hydraulic hard sleeve system as a safer, easier, and more space efficient way to store two to four, 125mm and 150mm hard sleeves over the side compartments of an apparatus. At the flip of a switch, the system lowers the hard sleeves to a convenient height for quick, easy, and safe retrieval.

Two self-contained hydraulic actuators provide increased strength and reliability and create a more even, parallel operating motion; allowing for the direct mounting of a hard cover without the need for additional hardware or adapter kits. The rugged, cast aluminium system sustains a maximum load of 225 kilogrammes and can accommodate an additional hard sleeve mounted directly to the top of the box.

Available in various sizes for installation on new or existing apparatus, the works with the Ziamatic hydraulic portable tank system.

For more information, go to www.ziamatic.com

Explosion-proof Call Point

E2S, the manufacturer of warning devices for use in hazardous areas, has extended its capabilities with the development of the GNEx range of ATEX and IECEx approved Exe d explosion proof manual call points in GRP housings.

Designed for the manual activation of fire alarms, gas detection and emergency shutdown systems, the units are environmentally sealed to IP66. They meet the requirements for rugged, corrosion resistant non-metallic units for both onshore and offshore environments. Available as standard in a range of colours, including striped versions, different systems can be colour-coded to enable rapid visual identification in an emergency.

Available with break glass, push button and push button with tool reset operation, a comprehensive range of standard accessories such as a stainless steel lift flap, labelling options for stainless tags and duty labels is available. Series and EOL resistors in a range of different values can be fitted to all models as required and DPDT switching and LED indicators can also be specified. The introduction of this new family complements the aluminium-bodied explosion proof and intrinsically safe call points, the BEx range of explosion proof sounders, beacons and loudspeakers, the E2x family of lightweight, corrosion-free PPS plastic and impact-resistant ABS units and the intrinsically safe IS-mini modular sounder and beacon offering.

For more information, go to www.e2s.com

Sydney to Host World Firefighter Games

Firefighters and emergency service volunteers from around the world will be taking part in the 2012 World Firefighters Games that this time around will be held in Sydney, Australia between October 19th and 28th. Organisers of the bi-annual event are already predicting winning the world governing body's coveted title of "Best Ever". The last Games, which took place in Daegu, South Korea, attracted more than 5,200 participants from 46 Countries. Nominations for the Sydney event have so far been received from more than 50 countries.

The Games are open to all full-time, part-time, on-call, volunteer and retired firefighters, aviation, military, paramedics, SES, country, rural and private services. Administration and trades staff, as well as direct family members, are also invited to participate. The World Firefighters Games is one of the world's largest sports participation events, and as many as 10,000 competitors, plus thousands more supporters and spectators, are expected to descend on Sydney for the Games in October. There are more than 70 sports on the program, including the legendary Toughest Firefighter Alive competition, tug-of-war and dragon boat racing.

For more information, go to www.worldfirefightersgames.com.au

Weber Rescue Systems

New Battery Combi Tools
SPS 270 E-Force & SPS 360 E-Force

A highlight of the year from WEBER RESCUE SYSTEMS is the introduction of two new battery-operated combi tools in the E-Force series of hydraulic rescue equipment – the SPS 270 E-Force and the SPS 360 E-Force. Thanks to their rechargeable batteries, these latest additions to the Weber Rescue line-up are lightweight, strong and flexible and provide rescue personnel with the maximum force without being connected to a power unit.

The modern and powerful 28 V Li-Ion battery-technology ensures a longer-lasting operating time and enables flexible operation in locations that are difficult to reach. A click-on/click-off system enables fast and easy battery change, saving valuable down-time. The lightweight and compact construction of the tools additionally saves space and weight in the fire truck.

Various accessories, such as a ram attachment, chain set, pulling device, battery charger, battery pouch and belt are also available, plus the batteries are compatible with other battery-operated tools offered by Weber Rescue Systems such as the reciprocating saw and metal-cutting circular saws.

The SPS 270 E-Force and the SPS 360 E-Force feature:

- Integrated, powerful 28 V Li-Ion battery-technology.
- Click-on/Click-off battery.
- High force – low weight.
- Long operating time due to 3,0 Ah capacity.
- Certified according to NFPA 1936-2010 ed. in following EN 13204:2005 ed.
- Extensive range of accessories.
- Unique ram attachment RZM 740.

SPS 270 E-Force Technical Specification:

- Spreading force 35 – 591 kN.
- Maximum cutting force (round steel bar) 25mm.
- Spreading distance 270mm.
- Pulling distance 358mm.
- Weight (incl. battery) 13.9 kg.
- DIN class K25-F-E-I .
- NFPA class A6/B5/C6/D6/E7.
- ID-No. 105.634.6.

SPS 360 E-Force Technical Specification:

- Spreading force 48 – 331 kN.
- Maximum cutting force (round steel bar) 28mm.
- Spreading distance 358mm.
- Pulling distance 440mm.
- Weight (incl. battery) 18.5 kg.
- DIN class K30H-I-E-I.
- NFPA class A6/B8/C6/D8/E7.
- ID-No. 105.632.2.

APF

SPS 360 E-Force

For more information, go to
www.weber-rescue.com

Product Innovation & Professional Services

– An Unbeatable Combination

Being a member of a fire and rescue service, you want to have the comfort of knowing that your personal protective equipment (PPE) performs at its best when it is needed the most: in each and every mission.

LION INTERNATIONAL is a leading PPE manufacturer and service provider for fire brigades around the world and day-by-day is taking on that challenge with its range of products and services.

Lion's widely renowned turnout gear, known under the brand name V-Force, incorporates various innovations to increase protection, comfort and durability, all in line with the relevant regulatory standards such as EN 469, NFPA 1971 and AS/NZ 4967.

New suit developments are widely used, such as the PU-Dot technology applied to the moisture barrier, which creates a space between the layers of fabric and so provides additional insulation against direct and radiant heat. Lion's perforated reflective trims significantly increase the breathability and the heat management in the suit and demonstrate that a number of collective incremental enhancements can have a substantial positive impact. Ergonomic design provides exceptional mobility, enables natural flexing motion in the knee and elbow area, reduces tensions and significantly adds life to high wear areas.

Fabric and component selection, composition of all elements, design and add-on features contribute to superior turnout gear. A mannequin test, in which the suit is exposed to direct flames from all sides for eight seconds, shows that the V-Force suit achieves zero percent 2nd and 3rd degree burn injuries. A value of less than five percent burn injuries is already very rare to find and serves as a good guideline for customers to differentiate between various protection levels. Despite these excellent results the various V-Force models are lightweight and very breathable.

To preserve the functionality of the turnout gear Lion has developed its TotalCare cradle-to-grave garment management program, which is provided to fire services around the world. In April 2011 Lion established its purpose-built TotalCare centre for the Hong Kong Fire Services Department in Hong Kong to maintain its 13,000 V-Force suits. This leading-edge service program includes the pick-up and re-delivery of the garments from over 100 fire stations and service points, professional laundering, decontamination, inspection and repair. The internal inspection mission statement is "every garment, every time" to ensure fit-for-purpose" gear for all firefighters.

Additional program elements include risk evaluation and, based on this, product design and development, financing instruments to address budget constraints, warehousing and stock management.

To maximise the benefit to both the fire service and end-user, each step of the process is tracked via 2D barcodes or RFID microchip technology. Data analysis assists more transparent reporting and improved internal process improvements, so increasing the asset (garment) longevity, reducing future capital expenditure requirements.

The cornerstone to the unique Lion TotalCare concept is that it is a truly global consistent model that is providing increased benefits to end customers by continually bench-marking and sharing improved procedures and outcomes from Lion's international TotalCare facilities in Australia, New Zealand, the USA and Europe. Sophisticated software with web-based customer front-end provides transparency throughout the whole TotalCare process for all service elements.

The combination of innovative products and professional services is a perfect match. **APF**

For more information, go to www.lioninternational.hk

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warrenh@lionapparel.com
www.lhd-group.de . **www.lioninternational.com**

New SERV Device Boosts Firefighting Efficiency

GRADALL INDUSTRIES has introduced what it calls the FA 50 strategic emergency response vehicle or SERV firefighting device, designed to be mounted on a fire truck to increase firefighting efficiency and safety.

The rugged hydraulic boom can telescope out 15.2 meters and uses a stainless steel fifth-man nozzle attachment to ventilate buildings by breaking through walls and roofs, as well as reaching through windows, rotating up to 220 degrees or swinging to the left and right. Once inside a burning structure, the fifth-man nozzle has 52 aqua-jet nozzles that direct a massive broken stream curtain of water, Class A or Class B foam into the fire.

Firefighters can control the FA 50 from over 60 metres away, using a wireless remote control device. This allows the firefighter to precisely position the apparatus with an easy-to-use system of controls on the belt-held remote device. For extra fire truck stability, the FA 50 is equipped with four stabilisers that are also controlled with the wireless remote. The stabilisers telescope out and down and can be positioned all at once or independently, providing short jacking capabilities.

For more information, go to www.gradallserv.com

Sensor Intelligence Fire Suits

Marine and fire safety equipment company, VIKING LIFE-SAVING EQUIPMENT has added technology to its range of fire suits that enables them to detect if a firefighter is in increased danger as things heat up. Every VIKING suit can now be ordered with the option of adding the company's thermal sensor technology (TST), which provides firefighters and those around them with clear warning signals as temperatures increase.

The company says that research shows that heart attack due to heat stress is the leading cause of death among firefighters in action, and that Viking fire suits equipped with TST technology are designed to reduce some of the factors that cause heat stress. Temperature sensors attached to two displays on the arm and shoulder indicate to firefighters and their teams critical temperatures, both inside and outside the coat.

Paradoxically, the company says that its technology is partially an answer to a problem that arises because today's fire suits have become so good at protecting their wearer. The heat insulating textiles in modern fire suits, together with other equipment, protect the skin so well against radiant heat that it is becoming a challenge for firefighters to detect critical temperatures in the critical minutes before they result in injury. If heat increases rapidly, the TST technology equipped suits generate a warning signal much more quickly than if temperatures are slowly rising, recognising that when things are heating up fast, firefighters need to exit more rapidly.

The TST microelectronics are durable and can be washed in a washing machine once the small computer/battery pack has been removed from an inner pocket. Beyond replacing the AA batteries, no further maintenance is required.

For more information, go to www.viking-life.com

MSA Airmaxx Delivers Maxximum Performance

Breath is life. This is why your breathing system needs to be infallible, particularly in those moments when you could be saving someone else's life.

The modern self-contained breathing apparatus (SCBA) offers a variety of features. Added functionality provides increased safety and capability but also increases complexity. Using novel technology and advanced material science, MSA has revolutionised SCBA pneumatics while simplifying the entire system. Normally an SCBA needs up to five separate hoses to supply medium pressure to the demand valve and second connector, to provide high pressure to the gauge and fast cylinder refill, and to feed the warning signal. SingleLine pneumatics revolutionises this system. One single hose is used for all lines and connections.

Part of the secret to this remarkable innovation is hose-in-hose technology. The high pressure line runs inside the medium pressure hose, which also provides an additional protective casing. With only one hose, the pneumatic system is safer in tight places.

Where hose-in-hose technology leaves off, clever engineering takes over. The medium pressure line, gauge, signal and second connector are all integrated into a single manifold on the user's chest. A rubber flap protects the signal whistle from mechanical impact and dirt.

The clever engineering extends to the integrated transponder that ensures easy inventory management. MSA holds multiple patents on the AirMaXX components, which is certified to AS/NZS 1716:2003 Respiratory Protection Devices.

The AirMaXX back-plate adjusts to three sizes for user comfort and customisation. Ergonomically designed and constructed of heat resistant glass fibre reinforced polyamid material, the AirMaXX ensures hoses are closely fitted for easy donning and safe usage in all environments. User comfort is assured with a class-leading premium comfort harness, durable enough for the toughest shift. Attached shoulder strap design prevents slippage and the S-shaped shoulder straps ensure unobstructed arm movements. A swivelling, adjustable hip belt balances between upper and lower body structures for improved weight distribution.

MSA's AirMaXX self-contained breathing apparatus is especially designed to withstand the harsh conditions of your job. Premium industrial applications and professional fire fighting – that is what MSA is all about. APF

For more information, go to
www.MSAsafety.com

Tower of Moscow

The Eusebi Group, through its Russian joint venture, OOO Plamya E1, has won an order worth approximately US$ 6 million for the design, supply and installation of a water mist system, EI Mist, to protect the Ostankino TV tower in Moscow. This 540-meter high construction, which in August 2000 suffered a terrible fire, is the tallest in Europe and among the five tallest buildings in the world.

The Russian Ministry of Communications has placed its trust in the excellence-driven partnership of Eusebi's Group parent company, Eusebi Impianti S.r.l, which will be responsible for monitoring and dealing with the engineering of this complex project, and the Russian joint venture OOO Plamya E1, which will supervise the assembly operations, leveraging its ample expertise and widespread presence in the area.

The Eusebi Group was chosen from three potential players, who are widely regarded as the most important and technologically advanced in the fire protection field. The challenge lies not only on the design and technical sides, but also arises from the extremely tight deadline. Indeed, the Russian authorities seek the permanent and full protection of the tower by February next year.

The water mist system, EI MIST HP, complies with fire-prevention standards NFPA 750, IMO 913, A800, and IMO/CIR 1165. It has been tested according to FM (Appendix G and H) and certified by Bureau Veritas. The nozzles are tested to UL standards and tests were conducted on cabinets and electric cables with RINA Industry. Furthermore, this Class 1 water mist system (minimum diameter of the sprayed water droplets below 100 microns) is deemed appropriate to extinguish both Class A – solid fuels such as paper and wood – and Class B fires – liquid fuels like gasoline and oil – according to the above standards. APF

For further information, go to
www.eusebi-impianti.it or
www.eusebigroup.com

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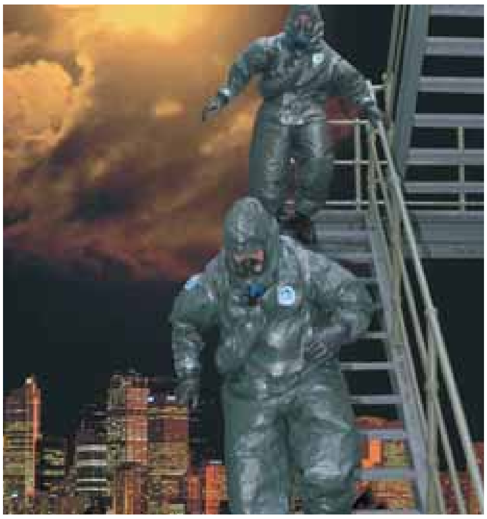
Long Time – Low Weight

The use of SCBA (Self-Contained Breathing Apparatus) has long been seen as the only form of respiratory protection for firefighting personnel, other professionals involved in emergency response and other demanding jobs. Notwithstanding its high protection levels, SCBA equipment has some inherent drawbacks. Two of those are common to all users of SCBA: time and weight.



The limited operating time of air cylinders can impact greatly on the emergency professional. In certain situations, carrying air in bottles on one's back is not the ideal solution. In instances where just getting to the emergency takes time and requires physical exertion, much of the available air might have been consumed already by the time the site has been reached. The other disadvantage is weight. Carrying air cylinders on one's back adds a physiological burden, increasing heart rate, body temperature and energy consumption.

The SE-shield system is designed as a practical alternative to SCBA in situations of protracted response work that requires a high protection factor, yet where there is a certain level of control:

- The hazard is known.
- The air is filterable.
- There is sufficient oxygen in the air.
- The atmosphere is not IDLH (Immediately Dangerous to Life and Health).

SE-shield is an integrated respiratory and body protection system (although the respirator can be worn without a protective suit). The core SE-shield component is a CBRN-approved fan-powered positive-pressure demand PAPR (Powered Air-Purifying Respirator) with face piece and filters. This single-button operated respirator can be further complemented with pressurised protective suits, as well as a range of backpacks, voice communication, storage kits, battery management, computer software, and accessories.

Designed for emergency response operations such as investigation, search-and-rescue, spill containment, hazard clean-up and much more, SE-shield is lightweight and eliminates the time restrictions of SCBA equipment, while maintaining a very high protection level. In addition, the SE-shield withstands intensive wet decontamination while still worn by the user.

CBRN Respirator

The SE40 respirator is approved for CBRN use by both European and American standards. The respirator maintains positive pressure in the mask even at very high work rates, by supplying air flows of 400 litres-a-minute or more. Like SCBA, the SE40 operates through a demand valve.

CBRN Filters

The filters carry both CE and NIOSH CBRN certification, and have been tested and approved for industrial chemicals and warfare compounds such as sarin, phosgene, nerve gas, cyanogen and more, including biological hazards. The filters have extremely low breathing resistance, great adsorption capacity and long service life.

CBRN Suits

The SE-shield system comprises a variety of encapsulated and non-encapsulated protective suits. One of the most common choices for emergency professionals is the military-grade Tychem F suit, impermeable to a large range of chemicals and warfare agents. The suits are fully integrated with the respirator, and can be pressurised internally by the fan unit.

Extended Operating Time

The respirator can be used for up to four hours on a single battery (depending on workload and breathing rate). A dual-battery configuration is available, extending the period even further. Sophisticated battery technology has resulted in long-life batteries with negligible 'memory'. The recharger analyses the battery and determines the best way to charge it to keep it in optimum condition. Mass-battery management systems are also available for storing, recharging and conditioning of large numbers of batteries over long storage periods.

Voice Communication

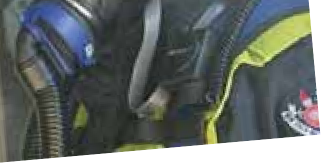
The SE40 comes standard with a microphone in the mask, connected to a powerful external mini-loudspeaker.

Storage & Accessories

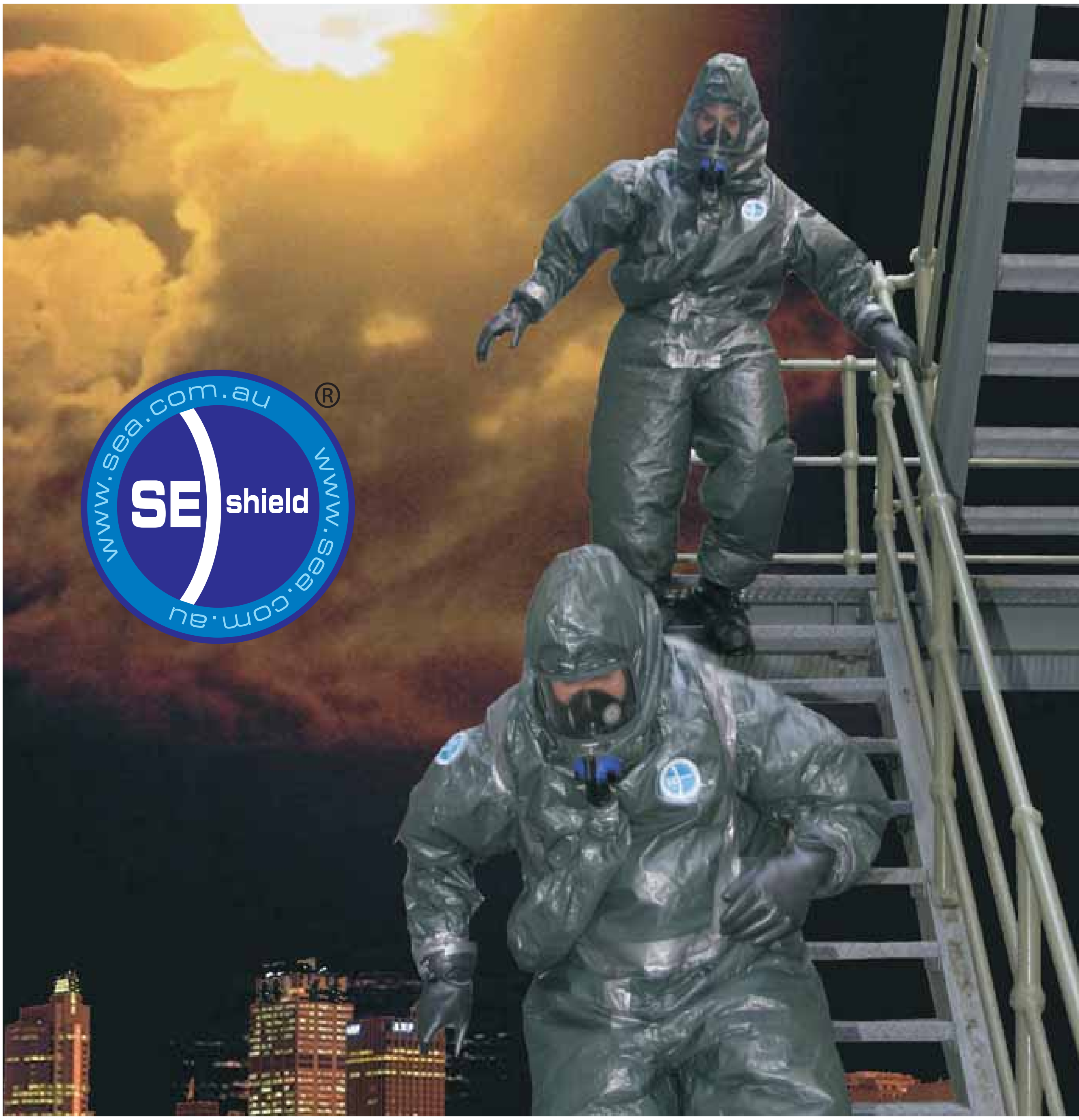
Practical use is an essential part of the emergency professional's job. That is why the SE-shield system incorporates a host of different carry options, hoods, shields and storage solutions, such as the rugged military-style readiness bag, containing everything required for rapid deployment.

The SE-shield system is used by emergency responders around the world, including police, forensic, medical and military groups, including specialist teams at several Olympic Games. **APF**

For more information, go to
www.theseagroup.com



Respiratory protection for first responders



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Up to 8h operation time
CBRN certified
Protective suits
CE & NIOSH CBRN approved

The S.E.A. Group

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Fires in high-rise buildings beyond the reach of ladder trucks pose unique and potentially dangerous challenges to firefighters attempting to battle the blaze directly. Elkhart's HERO Pipe system is a true game-changer. Because the HERO Pipe can deliver a high volume of water at the point of attack from the floor below, it is the first viable solution for high-rise fires.

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Magali Epin

Siemens Building
Technologies

Fire Safety: A tall Order?

Urbanisation is one of the most challenging megatrends that the world currently faces. In 2007, for the first time in history, more people lived in cities than in rural areas. By 2030, over 60 percent of the world's population will reside in urban centres.

A natural consequence of urbanisation is the move towards building up rather than out. The scarcity and therefore cost of available building space, coupled with the drive to maximise rental or sales income for every square meter, is increasing the number and also the height of high-rise buildings. For fire safety engineers, security officers and firefighters this brings its own specific challenges in terms of how best to protect the buildings and the people that live and work within them.

Many of the world's tallest buildings are iconic. This is particularly true, for example, of the Middle East where the drive to construct tall buildings such as the Burj Mubarak al Kabir in Kuwait, set to become the world's tallest, derives less from a necessity to cope with land scarcity than from a desire to create true landmarks for the region. For these high-profile superstructures, the stakes are considerable: the necessity to create icons, driven by increased competition for investors in the region and the need to attract tourists in greater numbers, is reflected by the level of technology implemented in these buildings. Providing the comfort and luxury expected by the tenants in such buildings requires a lot of cabling – climate control, lighting features, multi-media and communication technology – which itself increases the fire load.

Accommodating Asia's Expanding Population

For Asia, where the increasing density of the population is particularly acute – urban population in the continent is rising by 37 million a year – it is less about creating architectural landmarks and more about pure necessity. Although there are not a lot of statistics relating to high-rise buildings in Asia, the fact that the continent accounted for 34 percent of all high-rise buildings worldwide in 2005 helps to illustrate its importance. However, although high population density in the major conurbations is the main driver, the propensity towards creating an iconic statement is also undoubtedly still a factor for this region. For example, Hong Kong's tallest building, the International Commerce Centre (ICC), is a 118 story, 484-meter building which provides the centrepiece to Union Square at the multi-million-dollar MTR

Kowloon Station Development. It has a seven-star Ritz hotel at its summit, 93,000 square metres of apartments, 230,000 square metres of high-quality offices, and a 93,000 square metre shopping mall.

The ICC is a good representation of how the nature of high-rise buildings has changed. Traditionally their prime function has been to provide commercial office buildings. However, as people relocate increasingly towards the areas in which they work, there has been a rapid shift towards multi-use with residential, hotel accommodation and retail outlets now ever more common features.

Combating the Terrorist Threat

The iconic factor of many high-rise buildings and the potential for the large numbers of potential casualties that they represent also increases the risk of terrorist attack. The World Trade Centre twin towers demonstrated all too clearly the worldwide impact that an attack can have when striking at such a status symbol. In fire and security terms, this means that terrorist threats need to be addressed. Although the threat can never be completely eradicated, it can be reduced. Given the multi-tenant and multi-use nature of the new breed of high-rise buildings, integrating security measures can be a significant contributor to protecting the building.

Tall buildings are characterised by a small number of entrance points, so the ID of each entrant can feasibly be validated through technologies such as ID cards, multi-tenant access control systems and visitor management systems. When these are integrated with intrusion and video surveillance systems, this more holistic approach to security can help prevent incidents occurring. However, as already indicated, no security system can be 100 percent fool-proof, particularly given the need to balance security with accessibility, and therefore effective response measures need to be put in place.

Evacuation Takes Time

Evacuation in a high-rise building is obviously one of the key issues that need to be addressed in any emergency response planning. By their very nature, tall buildings accommodate many people and a great deal of property – furniture and fittings – in an environment where movement is restricted by elevators and stairways. In surveys conducted with high-rise residents, security and safety issues were recurring themes. For instance in a survey undertaken in Singapore, Hong Kong and Australia all residents named fire among their top concerns. The statistics from a report by the NFPA (National Fire Protection Association) in the USA, also suggests that this concern over fire safety is far from unfounded. The "High-Rise Building Fires" report cites apartments, hotels, offices and facilities that care for the sick as accounting for roughly half of all high-rise fires in the USA. Between 2005 and 2009, an estimated 15,700 reported high-rise structure fires a year resulted in associated losses of 53 civilian deaths, 546 civilian injuries and $235 million a year in direct property damage.

For the fire service, accessibility is obviously a major issue in high-rise buildings. This, coupled with the increased fire load, means that automated extinguishing is often employed. This helps prevent the fire spreading vertically, particularly in multi-use buildings that are characterised by large amounts of cabling. Building management and security systems for controlling smoke, elevators and doors are also often used, with smoke being a much greater threat to human life than fire itself. This was illustrated by a fire at the President Hotel in Bangkok in February 1997. Smoke swept through the 36-storey building and although the fire was shown to have started on the second floor, a number of fatalities were found on the building's top floors.

The human factor in an emergency is a consideration in any evacuation planning but in high-rise buildings it is particularly pertinent. The increase in occupant load through the sheer numbers involved means that how people respond in an emergency takes on an even greater significance. The reduced number of entrance and exit points in a tall building is a benefit in security terms but in evacuation terms it certainly is not.

A typical 18-storey building may take up to 30 minutes to be totally evacuated. As the number of stories increases, so does the evacuation time: a 50-storey building can take up to 75 minutes while in some of the most recent superstructure buildings, it can take as long as two hours to fully evacuate using the traditional staircase approach. This has led to many tall buildings adopting a zoned evacuation policy whereby people go to a safe area and wait there to be evacuated. However, this approach is very much dependent on quick and clear communication, instructing occupants to remain in place, as the natural instinct for most people will be to try to evacuate.

Evacuation via stairwells is still the traditional approach; however, there is on-going research into how elevators can be employed in evacuation scenarios. Received wisdom is that elevators should not be used and instructions via voice-based systems often specifically tell people not to use them. However, as buildings get taller and the corresponding evacuation times longer, alternative options are being explored. The Burj Khalifa in Dubai, the world's current tallest building at 828 meters, with its bottom 39 floors housing an Armani hotel incorporating 160 guest rooms and suites and 144 residences, is the first mega high-rise in the world where certain elevators can be programmed to permit controlled evacuation in the event of a fire or security threat.

Addressing the Human Factor

When we talk of natural instincts, although it might be considered reasonable to assume that the 'fight or flight' instinct will be common to just about all involved in the heightened sense of emotion generated by an emergency situation, believing that everybody will respond in the same way is a high-risk assumption to make. Many people will believe a ringing alarm is either a test or a false alarm, particularly in a building that has been subject to regular incidences of false alarms. This can cause hesitation or, in worst case scenarios, complete disregard for the alarm.

Even if the alarm does instigate action, what form that action will take is open to question. If people are in unfamiliar surroundings, they are more susceptible to panic, not knowing what to do or where to go when a simple tone-based alarm sounds. The fact that tall buildings have more people in them and many such buildings are subject to a higher ratio of infrequent visitors means that this is a particular consideration. If you take hotels as an example – and this is an area where high-rise is becoming an increasingly common option – it is highly likely that guests are unfamiliar with the surroundings. Voice evacuation systems certainly help in this regard by following-up the alarm tone with a spoken message giving specific instructions. Some systems can also deliver live information rather than just pre-recorded messages to allow the evacuation to be better coordinated and the messages specifically tailored to the changing requirements as the emergency unfolds.

The introduction of mass notification systems has also helped to develop this more structured and more considered approach to evacuation. Multi-modal mass notification not only warns people of danger, but also provides concise instructions via live or pre-defined messages over multiple communication channels, often utilising mobile phones and instant messaging, to guide them to safety in potentially life-threatening situations.

Coordinating the Emergency Response

To ensure efficient incident management in rapidly evolving building environments, there is a need to look towards performance-based codes and systems that can help better address today's challenges in emergency response and evacuation. The present move towards intelligent response systems to support the human response is a consequence of this, driven by technological advance in IT and communications.

For those responding to an incident, speed and agility are critical. This requires situational awareness and automation of processes to free-up resources to tackle the more critical areas or stages of the incident. Command and control systems are increasingly being adopted that use one platform to control both emergency and non-emergency systems. Taking a fire or an earthquake in a high-rise building as an example, a number of different personnel could well be involved in responding. The fire service will typically be the first responder but a major incident could well require support from medics, police, security personnel and engineers. Coordinating the response and ensuring swift and, importantly, clear lines of communication between the different elements is critical. Real-time evaluation of the evolving incident and relaying that information in a structured and pre-planned way can not only save lives but also significantly reduce building damage, the environmental impact that a major fire can have and keep the recovery time to an absolute minimum.

Tall buildings undoubtedly provide their own fire safety challenges. The regions in which they are built, the number of people they accommodate and their value – both in monetary and symbolic terms – all contribute to the need to prioritise their protection. **APF**

Magali Epin is responsible for Business Development at Siemens Building Technologies

For further information, go to www.siemens.com/infrastructure-cities or www.siemens.com/buildingtechnologies

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Delta Fire Australasia

Monitored Performance

Choosing and using the right fire monitor can make all of the difference when it comes to warding off disaster.

Fire monitors are a front-line firefighting resource, particularly in high-hazard environments where action needs to be both prompt and efficient if an initial outbreak is not to escalate quickly into an inferno with dire consequences for mega-million-dollar assets, the lives of employees and firefighters, and the surrounding environment. So, while – thankfully – they spend the vast majority of the time inactive, when the call to action comes they have to be in tip-top working order, be matched to the particular fire risk, be located where they are needed or be swiftly moved to where the action is.

Although there are a growing number of first-rate fire monitors on the market, there are really just two types – fixed and mobile monitors. The fixed monitor, as the term implies, is a monitor that is attached permanently in place to pipework and is positioned to attack a fire at a specific fire risk. This is most often a high-hazard Class B fire risk that involves flammable liquids such as petrol and diesel, as well as solvents, lubricants and spirits. So fixed monitors are commonly used for the protection of petrochemical refineries, LNG (Liquefied Natural Gas) and LPG (Liquefied Petroleum Gas) facilities, tank farms, fuel distribution depots and loading jetties, chemical processing plants and offshore rigs, as well as for maritime facilities and aircraft hangers where the position of the fire risk is constant.

The second type of monitor, the mobile or portable monitor, is used to tackle the same Class B fires, but offers the versatility to be utilised to protect a number of fire risks around a particular site or facility. As the terms "mobile" implies, they can be trailer mounted for fast deployment, or they can be positioned by hand. In either case they do require a water supply, which is usually provided by hose connection to a hydrant or portable pumps. This, of course highlights the importance of the positioning and effectiveness of fire hydrants if reliance is placed on mobile monitors.

Clearly, choosing between fixed monitors or mobile equipment can have serious implications; it is not as straightforward a decision as it may first appear. A major benefit of a fixed monitor is that it can be brought into action to fight a particular fire faster than a mobile unit that has to be accessed, transported, manoeuvred into place, connected to a water supply and directed at the blaze. However, the majority of major petrochemical fires are often preceded by one or more explosions that have the very real potential to destroy fixed equipment before it has even had time to be brought into effective action. Arguably then, relying entirely on fixed monitors can be a high-risk strategy.

On the other hand, reliance on mobile or portable monitors inevitably means some delay before firefighting commences. It is also imperative that each of the site's possible fire scenarios is carefully assessed so that this delay is not extended while, for example, the most effective positioning of the monitors is established. This requires expert fire planning, taking full account of the throw characteristics of the monitors, the proximity of hydrants, the need for the correct hoses or pumps – in some instances even the possible prevailing wind direction and speed. Unarguably, this detailed fire planning is essential if reliance is to be placed on mobile firefighting solutions.

Frequently, the best solution is a combination of fixed and portable monitors, with fixed monitors acting as the first line of defence, and portable monitors used to protect bunds, deal with fuel spillages and vapour concentrations, and cool adjacent fire risks.

Monitor Operating Method

Monitors can be operated either manually by the firefighter or be remotely controlled.

The advantage of remotely controlled monitors is that the firefighter can operate the equipment at a safe distance from the fire. The firefighter is able to remotely redirect the monitor in both the horizontal and vertical planes and, on the most versatile units, adjust the flow, stream pattern and throw of the monitor. Power is either hydraulic or electric; each method having particular benefits. Many manufacturers now offer the option of both hydraulic and electric, as well as both manually operated and remotely controlled monitors.

For applications where the monitor is likely to be used in areas where explosive gases may be present, electric remote control can be supplied with explosion-proof EEx (e) and flameproof EEx (de) electrical equipment in accordance with ATEX [ATmosphères EXplosibles] guidelines. These ATEX guidelines are similar to the USA's NEC (National Electrical Code) guidelines, although the ATEX system seems widely regarded as the more comprehensive of the two, so ATEX is often the preferred system. The IEC [International Electrotechnical Commission] standard is now mandatory for electrical equipment in Europe and Asia Pacific.

Ticking the Right Boxes

It is imperative that the site operator can depend on the monitor to deliver its promised performance at a moment's notice. With monitors now in widespread use protecting a wide spectrum of high-risk facilities, they need to be robust and unerringly reliable even in the most demanding chemical and marine working conditions. In terms of monitor build quality, low maintenance and particularly an extended working life, those manufactured using corrosion resistant materials such as high-grade stainless steel for the monitor body and bronze for the nozzle and bearings have an obvious appeal.

The jet reaction force of a monitor can be considerable, so even the smaller portable hand-positioned monitors need to be securely restrained to ensure that they remain "on target" when in operation. The larger mobile monitors that are often trailers-mounted rely on the stability of the trailer unit so frequently incorporate stabilising outriggers similar to those used to provide stability to aerial platforms or "cherry pickers". Some trailers incorporate water tanks that increase the trailer's weight and provide additional stability, at least while the water tank is full.

When selecting a mobile monitor its compactness, light weight and the incorporation of low friction bearings for easy manoeuvrability are also potentially important considerations to be taken into account.

Which Monitor?

There are a number of manufacturers that produce ranges of quality-built monitors; typical among these, and among the best know are those manufactured by Svenska Skum in Sweden and Shilla Fire in Korea. Both ranges are used widely across the Asia Pacific region and include portable, oscillating, manually operated, and remote hydraulically operated and electrically operated remote fog/jet, water/foam monitors. Many of these models are FM (Factory Mutual) approved and certified by such globally renowned organisations as DNV (Det Norske Veritas), Rina (Registro Italanio Navale), and BV (Bureau Veritas).

In brief, oscillating monitors automatically move from side to side when discharging and are normally pre-set to swing back and forth over a given arc, typically set to arcs of 30 degrees, 50 degrees, 70 degrees and 100 degrees to deliver a uniform foam or water blanket in every sweep. By comparison, fixed-nozzle monitors have nozzles that have a pre-set angle of elevation and discharge pattern calculated to deliver the most effective stream pattern and range

In these ranges from Skum and Shilla, portable monitors are available that deliver up to 3,000 litres-a-minute and come with the option of dual connection, automatic oscillation and a built-in foam inducting nozzle. Manually-operated, self-oscillating monitors are available with capacities of 3,700 litres-a-minute, 6,000 litres-a-minute and 11,700 litres-a-minute. Some models incorporate built-in foam induction, and depending on the particular model and capacity, the range can be between 75 metres and in excess of 90 metres. These capacities and throw lengths are extended in some of the manually operated monitors, where the maximum capacity is 20,000 litres-a-minute and the maximum throw is over 120 metres.

The remotely controlled hydraulic monitor has capacities of 6,000 litres-a-minute and 11,700 litres-a-minute, with a maximum throw in excess of 90 metres. By comparison, the remotely controllable electric monitor range offers up to 6,000 litres-a-minute to a maximum jet throw of 80 metres, 11,700 litres-a-minute to a distance just over 90 metres, and a reach of 120 metres for the 20,000 litres-a-minute model. Optional components include a control and operating panel, which can be either the standard model or be custom-built, suction hose and valve, and explosion protected EEx (e) and flameproof EEx (de) electrical equipment. All include a manual override option.

Large capacity "FiFi" monitors with dual capacities of 5,000 litres-a-minute and 20,000 litres-a-minute are predominantly used in marine applications. Special-order monitors with flows of in excess of 30,000 litres-a-minute are also now available. **APF**

Bob Grieve is Managing Director of Delta Fire Australasia Pty Ltd

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Graham Collins

Monitors Round-Up

Call them what you like – fire monitors, water cannons, deluge guns or foam monitors – they are essential firefighting equipment, particularly in high-hazard, high-risk environments, so it pays to keep up to date with the latest equipment to come onto the market.

New Portable Electric Monitor

AKRON BRASS has introduced the Apollo PE, Style 3419a, new portable electric monitor designed and tested for superior firefighting, exposure control and HazMat mitigation, said by Akron to be the only portable electric monitor on the market that features a quick-change battery system.

The Apollo PE combines high-flow 4800 litres-a-minute capability with a self-contained battery and electronic control system. When the primary battery module is depleted, it can be removed within seconds and replaced with a fully charged battery module extending the run time. The battery modules have an LED state-of-charge gauge to check their status at a glance and is capable of running the monitor for three hours while at maximum flow and in continuous oscillation mode. When mounted on the truck, the Apollo PE can be connected to the apparatus power to maintain the battery at maximum capacity.

Akron's new monitor PE utilises a new on-board microprocessor-based control system with built-in wireless capability to allow operation from a safe distance. Akron's standard wireless handheld control along with a variety of Akron Brass CAN-based "plug and play" control devices, such as joysticks and toggle switch operator stations, can be used to operate the monitor providing multiple control options. The Apollo PE can be programmed to oscillate anywhere within its horizontal range and the oscillation range can be adjusted while the monitor is oscillating.

The Apollo PE maintains the range of motion from the classic Apollo monitor allowing 180 degrees of horizontal motion while in portable mode, and 355 degrees when mounted on the apparatus. The Style 3419 also uses the same ground bases as Akron's current Apollo monitor making it an easy upgrade to existing equipment.

As technology changes, the monitor's software can be upgraded by utilising the convenient USB port for quick feature updates. The new monitor can be used with Akron's standard 5177 Akromatic 1250 nozzle, 1577 SaberMaster nozzle, or a variety of deluge and stack tip sets.

For more information, go to www.akronbrass.com/3419-apollo-pe-monitor

New Monitor Technology

According to ELKHART BRASS, its EXM monitor and control technology is finding its niche in airport rescue firefighting (ARFF) and municipal firefighting to deliver a higher level of performance and durability.

To increase durability in these target applications, Elkhart designed monitor joints that feature a stress-reducing stainless steel rod. The rod extends through the centre of the joint tying monitor components together. This improved design is said to not only reduce stress on the traditional ball bearings, but also ensures proper gear alignment for the life of the product. Higher torque inherently sealed motors also help increase durability.

The micro-processor based controls for the EXM monitors, coupled with absolute position feedback sensors, allow for fully programmable motion control without the use of mechanical stops that greatly increase stress loading over the life of a monitor. These controls are upgradable via USB, reducing the need to physically access the control circuit boards, and enabling the control boards to be potted (completely encapsulated in an insulated plastic material) avoiding potential failures from water penetrating into the control enclosure.

The EXM user selects the monitor, controls, nozzles, valves and accessory components best suited for its application. The monitor also features fully programmable settings. Travel limits (horizontal and vertical), oscillation (single- or dual-axis), block-out zones, travel speed, and stow or home position are all also user selectable. Incorporating programmable block-out zones eliminates potential collisions with other equipment on-board the apparatus.

An ergonomic, proportional control joystick provides easy operation and improved control. The RF handheld with docking station provides a functional storage solution while also ensuring the rechargeable lithium ion battery is always ready for use. Integration of electric valve controls with all EXM devices through reliable CAN communication also improves operator control. Product performance was also an improvement with the EXM technology. Elkhart's design team improved flow efficiency by between 25 percent and 30 percent. This equates to higher flow rates with less energy requirements.

For more information, go to www.elkhartbrass.com

Extensive Monitor Line-up

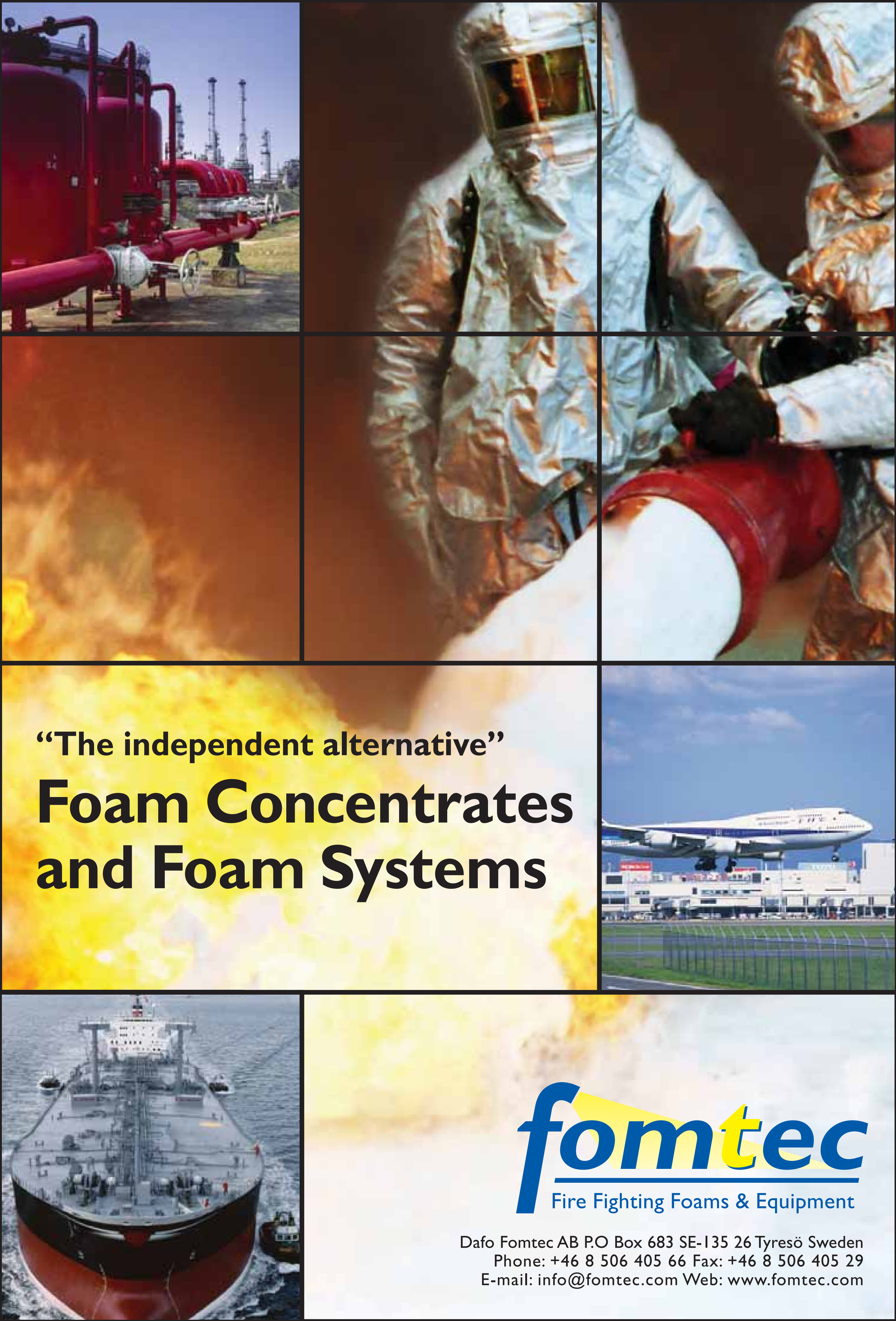
PROTEK'S range of monitors designed for water, foam and CAF applications is said by the company to: "optimise advanced computer aided design and testing technology, offering features such as cast-in vanes for high flow efficiency with minimised flow turbulence". Among the claims made for them are that they are highly manoeuvrable and easy to operate. Protek's wireless remote-controlled monitors ensure the effective use of firefighting personnel and lower the potential risk of injury from manual operations. All are compatible with Protek's wide range of master stream nozzles.

Protek's industrial monitors are highly manoeuvrable and easy to operate while delivering up to 4800 litres-a-minute, and incorporating features that meet the changing demands of the fire service. The company's portable ground monitors are also highly manoeuvrable, operating like hand line nozzles while delivering significantly more water. They are compact and lightweight with a low-profile design for stable operation; they are simple to set up for quick attack operations, and can be left unmanned at the fire scene to conserve manpower. The monitor body is constructed in hard-coat anodized aluminium with tough powder coating. They are available in either single-inlet or dual inlet.

The company's dual-purpose ground monitors are available in either portable or deck-mount models. Protek's portable oscillating ground monitors have an effective sweeping water stream, designed for attack, cooling, protection and HazMat situations. They are powered by a water-driven turbine that sweeps the outlet back and forth in a smooth and powerful motion while unmanned. These monitors too can be left unmanned, enabling resources to be deployed elsewhere. They are available as either single-inlet or dual-inlet models.

Protek's remote-control monitors are suitable for operations such as wildland firefighting. This compact, lightweight, alloy-constructed monitor features a fully sealed integrated electrical control system with waterproof locking connectors and power and control connections to withstand harsh environments. The monitor is designed for water, foam and CAF applications. Protek's wireless remote-control monitors are electrically controlled deck monitors. There are no control cables between the joystick/transmitter and the monitor, which significantly reduces installation costs. These monitors provide easy programming of oscillation.

For more information, go to www.protek-fire.com.tw



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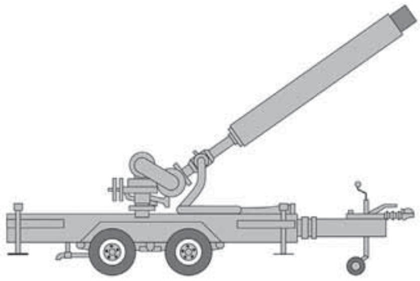
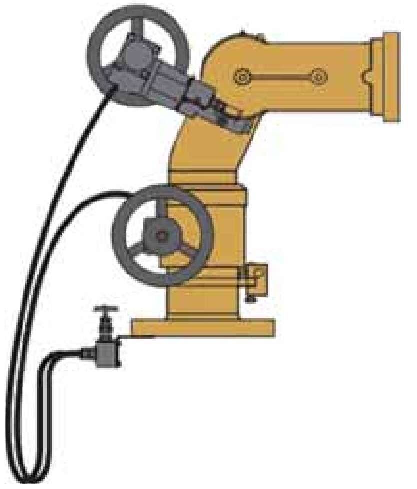
All-needs Monitors

The Titan monitor range from ANGUS FIRE covers flow rates from 3,000 litres-a-minute to 8,500 litres-a-minute in bronze and up to a massive 50,000 litres-a-minute with a reach of over 160 metres in stainless steel. There are four basic models in bronze and seven in stainless steel to match all industrial and professional fire fighting applications.



Titan monitors come with a choice of three manual actuation modes: lever operated; gearbox with hand-wheel control; or automatic oscillating. In addition, models from 5,000 litres-a-minute upwards can be fully remote controlled by hydraulic, electric or hydraulic/electric motors. A range of 18 fog/jet nozzles and 36 foam cannons complete the Titan range. There are also three self-oscillating monitors, including the original bronze OM80 model specified for offshore applications, with the largest models giving a sweep angle of 350° using Titan oscillating motor technology.

All Titan monitors up to 50,000 litres-a-minute can be trailer mounted to enable the equipment to be moved to an incident site quickly and easily. Self-inducing foam fog/jet nozzles are available for flows up to 4,000 litres-a-minute and self-inducing foam cannons are available up to 15,000 litres-a-minute. Water or foam jets up to 50,000 litres-a-minute complete the range.The remote control monitors are normally rated EExd IIB T3 and can be used in areas where explosive atmospheres are present. A full range of remote control panels for safe areas or to EExd IIB T3 specification are available and all monitors have a manual override in the event of a power loss.



A new software tool is also available to allow designers to predict the height and distance of a jet of water or foam for any combination of monitor and nozzle or cannon. Once the monitor and nozzle combination has been selected, the user can vary the angle of elevation, monitor inlet pressure and wind speed to see where the jet will land under varying conditions and how much height clearance will be available. This unique tool provides designers and users the opportunity to tailor their equipment to specific site conditions in a way that has not been available before.

For more information, go to www.angusukfire.co.uk

Full Range Offering

Since 1971, TASK FORCE TIPS has been providing a full line of portable, fixed, and remote control firefighting water and foam monitors to fire professionals worldwide. Dedicated to innovative designs and rugged dependability even in the harshest firefighting environments, TFT says that its high performance equipment provides maximum stream reach while minimising friction loss. Produced from high strength aircraft grade aluminium alloys and stainless steel, all monitors are hard-coat anodized to military specifications and powder-coated for maximum corrosion resistance.

TFT offers three models of lightweight quickly deployable monitors. The BlitzForce, rated up to 2000 litres-a-minute, weighs only 6.9kg and includes an integrated safety tie down strap for added convenience. The Blitzfire is also rated up to 2000 litres-a-minute and according to the company provides the lowest attack angle of any portable monitor ever produced and includes, as standard equipment, a safety shutoff to prevent unintentional movement during operations. The Crossfire is TFT's largest portable monitor providing flows up to 4500 litres-a-minute and weighs only 18.3kg. It is truly a multi-functional monitor, as it can be integrated into a fire apparatus' fixed plumbing, or used portably on the ground for large scale fires.

For fixed applications, TFT has engineered a wide range of products to meet varying industrial and municipal fire apparatus demands. The Tornado fixed monitor is rated to 2000 litres-a-minute, the Hurricane and PROtector monitors to 4500 litres-a-minute, the Typhoon to 6000 litres-a-minute, and finally the Monsoon with a 7600 litres-a-minute capability. Each monitor is available with a matched fixed, selectable litreage, or automatic pressure control master stream nozzle designed specifically to provide maximum stream performance. All monitors are available with a choice of threaded or flanged inlets to allow simple installation on either mobile fire apparatus or in fixed fire protection systems.

All fixed system monitors are also designed to be remotely controlled. Using TFT's 900mHz (US) or 2.4gHz (Global) radio frequency controller technology all monitor functions can be operated at great distances maximising limited staffing during major incidents. Offering FM, CE, and ATEX certifications, TFT monitors include a five year factory warranty.

For more information, go to www.tft.com

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Raising the Alarm on Bus & Coach Fires

Scott Starr

Firetrace international

The disturbing number and severity of bus and coach fires across the Asia Pacific region is rightly causing public concern and is a challenge that bus builders and operators need to take more seriously, particularly as solutions exist that can be fitted to both new and existing fleets of vehicles.

The catalogue of recent bus fires in the Asia Pacific region is certainly cause for serious concern.

A recent fire in a crowded bus in Limapuluh Kota, a town in West Sumatra, Indonesia, resulted in the death of 13 passengers, including five children; 12 others were hospitalised with burns. According to local police reports, the driver halted the bus when he saw flames pouring from the engine; he then panicked and ran away, leaving around 50 passengers to try to escape through the back exit. However, the rear door jammed and piles of goods blocked the way. Although not corroborated, a short circuit is believed to have initiated the blaze.

Whether or not the driver, had he remained, could have helped clear the obstructions and unjam the rear door we may well never know. What can be said with certainty however is that, had an effective fire detection and suppression system been installed in the engine compartment of the bus the outcome would have been – at worst – a delay in the journey.

The 45 passengers on board a bus that caught fire in Savusavu, on the Fijian island of Vanua Levu fared better, thanks in part to the prompt action of the driver. Again though, no fire detection or suppression system was installed in the vehicle. The Republic's National Fire Authority has revealed that overheating of the engine resulted in the bus catching fire; in this instance a situation that was made far worse by some of the passengers carrying flammable liquids such as kerosene, diesel and premix onto the bus. This particular instance followed another bus fire a few days earlier when passengers were forced to jump out of the windows when a bus caught fire in Urata after leaving Savusavu for Labasa.

RAISING THE ALARM ON BUS & COACH FIRES

Just days before writing this article, 17 people, including six children and two women, were killed in a bus fire in the city of Bahraich in Uttar Pradesh, India. A further 56 were hospitalised with burns or other injuries.

In citing these particular incidents it might, of course, seem reasonable to suppose that the high incidence of bus fires is confined to parts of the world where vehicle maintenance is sometimes absent and where passenger safety standards are lacking. Reasonable, possibly; but incorrect nevertheless. Bus fires are a global problem and are equally all too common in more developed countries.

For example, both the Norwegian Public Coach Administration and the Swedish Road Administration have concluded that approximately one in every 100 buses is involved in a fire incident each year. As many as 2,600 bus fires occur every year, and significantly more go unreported, according to the National Transportation Safety Board (NTSB), a United States federal government agency. A study conducted by The Volpe National Transportation System Centre in Cambridge, Massachusetts concluded that there were a reported 899 motor coach vehicle fires reported from 1995 and 2008, roughly 70 a year.

In July 2011 a bus operated by the State Transit Authority in New South Wales, Australia caught fire while returning – fortunately without passengers on board – to its depot. The bus driver was alerted to a fire in the rear of the bus by a passing motorist. He stopped and attempted, without success, to extinguish the fire in the engine compartment with a portable fire extinguisher. By the time the fire and rescue service arrived the fire had spread to the interior resulting in the bus being totally destroyed.

Bus & Coach Fires – The Facts

As every fire professional knows, fire can spread at an alarming speed, and bus fires are no exception. The average time lapse before a bus or coach interior is fully engulfed in smoke is just two minutes, and the average amount of time before a bus or coach is swallowed up in flames is only four minutes. So, considering that passengers have to escape via a limited number of exits, and that a significant proportion of passengers may be children, elderly, disabled or infirm, speed of effective response to a fire is critically important. And dealing immediately with a fire, precisely where it occurs is the only sure way of guaranteeing passenger and driver safety, not to mention saving an expensive business asset from destruction.

While some bus and coach fires are the result of collisions or other road traffic accidents, reliable statistics bear out the fact that the vast majority have their origin in the vehicle's engine compartment. But why?

Mechanical and electrical failures or malfunctions account for around three-quarters of all on-highway vehicles fires, according to the US Department of Homeland Security NFIRS [National Fire Incident Reporting System] and the NFPA [National Fire Protection Association]. In something like 60 percent of the cases, the most common site for an outbreak is in or around the engine compartment, the running gear or wheel areas. This is because, in addition to fuel and the risk of fuel-line ruptures, there are a number of flammable liquids present throughout any vehicle engine compartment, such as hydraulic, brake, automatic transmission and power steering fluids. Additionally, there is often combustible accumulated grease on the engine block, for which frayed or damaged electrical wiring can easily provide the ignition source.

Even those buses and coaches with the latest technology are at risk. Regenerative braking systems on hybrid diesel-electric buses and coaches – while resulting in significantly improved fuel economy and greatly reduced emissions when compared with standard diesel engine vehicles – incorporate rechargeable energy storage systems that are a potential fire risk.

Ticking the Right Boxes

There are several factors that make up a successful bus or coach fire detection and suppression system. These are:

- The chosen system should combine automatic detection and suppression as a single, integrated

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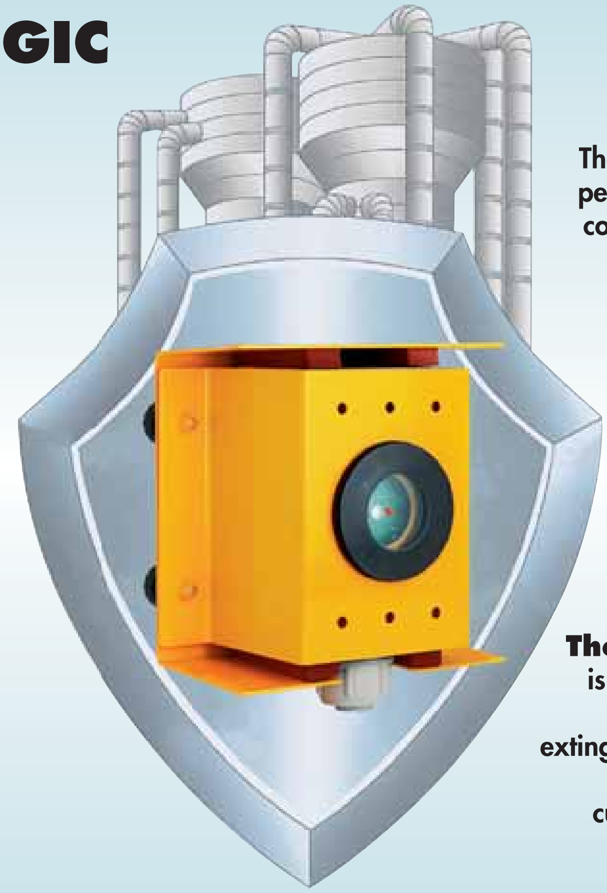

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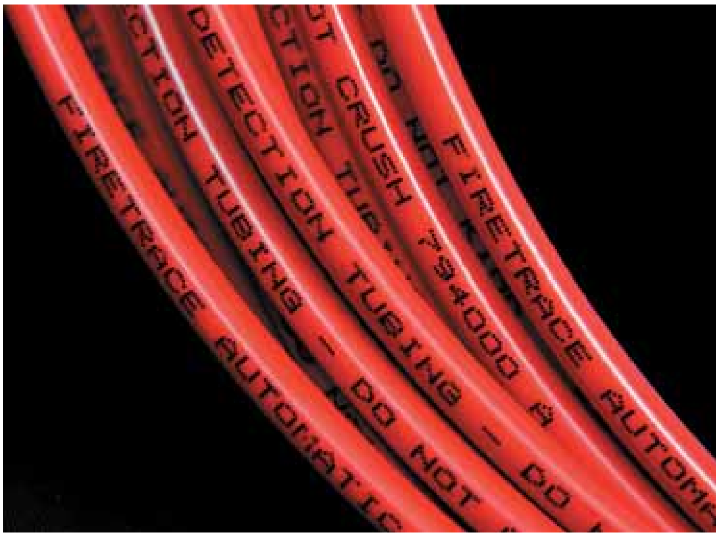

solution, as it is of partial value only for a fire to be detected and then be left to burn; likewise, suppression that has to be manually activated inevitably involves delay or even non-activation.

- The system should be focused on the area of greatest fire risk – the engine compartment.
- Bearing in mind the two-minute and four-minute figures quoted earlier in this article, the selected solution should provide immediate and effective response to the initial outbreak.
- The system should be able to contend with the temperature variations likely to be experienced in an engine compartment, the expected presence of dirt, grime and accumulated grease and the inevitable vibration of a moving vehicle.
- The reliability or effectiveness of the system should not be compromised by the unavoidable airflow in and around the engine compartment when the bus or coach is in motion. This is because heat and flame typically rise from the source of a fire and, in a moving vehicle, are likely to be propelled elsewhere.
- Particularly in countries where maintenance regimes can be somewhat haphazard or poorly managed, the need for minimal maintenance is an obvious advantage. Also installing a system that is intrinsically safe and that requires no external power source adds to the solution's dependability, further removing the need for human intervention.

To this list it may well be essential to add the ability to retrofit the chosen system to existing buses and coaches in the fleet, irrespective of the age of the vehicles or whether they are front-engined or rear-engined. Of course, most fleets comprise vehicles of varying ages, designs and specifications.

Meeting the Challenges

Several systems have been promoted as being suitable for bus and coach engine fire protection. However, the vast majority fail on one or several of the key points listed in the previous section. In many cases, these failures are as a direct result of attempting to adapt a conventional fire detection and alarm system – typically, a system designed to protect entire buildings – to the very different environment, and in many senses far more challenging needs, of a bus or coach engine compartment.

The reality is that bus and coach engine compartments need to be protected by a system designed specifically for that purpose. In short, one that does tick all of the boxes.

Take, for example the Firetrace system. It is a fully automatic detection and suppression system that requires no external power and no manual intervention; it responds immediately to an engine compartment fire, precisely where it breaks out, and floods the engine compartment with suppression agent. The system is pre-engineered utilising robustly engineered components that can more than contend with the extreme environment inside an engine compartment.

Briefly, it comprises a standard-size pressurised extinguishing agent cylinder attached to proprietary Firetrace Detection Tubing. This polymer tubing is routed around the engine and compartment to provide linear pneumatic heat and flame detection that is immune to the vibration, shocks and temperature extremes found in an engine and compartment. Immediately a fire is detected, the tubing ruptures and automatically releases the suppression agent, extinguishing the fire precisely where it starts and before it can take hold. The tubing is placed both above and behind the potential source of fire to ensure that the inevitable airflow in a moving vehicle actually helps by directing the heat and flames towards the tubing, providing faster and more reliable detection and suppression.

Dry chemical powder is the most commonly used suppression agent for these applications. Upon discharge, the agent floods the entire compartment and leaves a residue that absorbs flammable liquids and helps avoid re-ignition. The system is fitted with a pressure switch that constantly monitors the contents of the cylinder. This switch can also be used to sound an alarm in the driver's cab in the event of a system discharge.

With reliability being such a high priority, it is worth noting that over 150,000 Firetrace systems have been installed around the world and there has never been a single reported incidence of a properly maintained and installed Firetrace system failing to detect and suppress a genuine fire.

Beating the Odds

Any bus or coach company operating a fleet that does not have effective engine compartment fire protection is embarked on a high-risk strategy aimed at beating the odds.

Insurance company estimates suggest that the average cost of a bus fire, in terms of asset damage alone, is in the region of US$100,000. The potential for this sum to be dwarfed by civil actions brought by the relatives of passengers killed in a fire, or by those injured, is staggering, particularly as the risk of fire in buses and coaches is now so frequently and widely publicised. Compare this with the cost of installing effective fire detection and suppression solution and there is no doubt where the smart money goes. **APF**

Scott Starr is Director of Marketing at Firetrace International

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Alarm Systems in Perf

Roderic Jones

RAWFire

A performance-based approach to fire safety is increasingly being adopted within buildings in lieu of satisfying the prescriptive requirements of the local building code. This approach provides a level of flexibility in building design that can provide significant benefits to the design team and client in terms of cost, aesthetics and functionality. In many cases additionally specified systems may provide an increase to the level of life safety afforded to the occupants of the building.

When developing an alternative approach to fire safety it is critical that an effective fire safety strategy is prepared, and a key component of this is the evacuation strategy for the building.

When assessing the evacuation procedures, the fire safety engineer should consider the nature of the population, the management procedures as well as the fire safety systems proposed and the complexity of the built environment. There are both first principal and computer simulations that may be used to substantiate the proposed solution.

The absolute value obtained from the evacuation modelling is referred to as the Required Safe Escape Time (RSET). The RSET is a measure of the total evacuation time and is defined within British Standard PD 7974-6:2004 (*The application of fire safety engineering principles to fire safety design of buildings. Human factors. Life safety strategies. Occupant evacuation, behaviour and condition*) as the sum of the detection time, alarm time, pre-movement time and the travel time.

The RSET is then typically either compared against a known RSET value for a building designed in accordance with the Building Code; or the evacuation modelling results are compared against the results of a fire model. The latter approach provides an absolute value for the time to untenable conditions or the Available Safe Escape Time (ASET).

When the time to untenable conditions is greater than the evacuation time plus some margin of safety then the building may be deemed to achieve an acceptable level of life safety. If however untenable conditions occur prior to evacuation of the building then additional measures must be taken to either prolong the time to untenable conditions or reduce the time taken for occupants to escape.

There are a number of often expensive means by which to increase the time to the onset of untenable conditions that may include; the provision of additional smoke control systems, increased compartmentation levels, automatic fire sprinkler systems or by incorporating management procedures that may manage hazards and fuel load in a particular area. In addition to the expense, these solutions may require significant structural changes, moving the design away from the architect's vision, and/or the reworking of existing services and plans to provide adequate space to install the necessary infrastructure to service the new systems.

In some instances however there may be the potential to provide a life safety solution that does not rely on significant physical changes to the building and one which may help to reduce the total evacuation time often at a fraction of the cost of installing an automatic sprinkler or smoke control system.

When assessing the evacuation strategy it may not be possible to make physical changes such as providing greater egress width or additional exits, this is especially true in high-rise buildings. These limitations can make the reduction of the travel component of the RSET difficult.

ormance Based Design

It is therefore the pre-movement time that should be examined for potential time savings. It is often assumed that the travel time will form the largest part of the total evacuation time (RSET) from a building; however this is not always the case. There are a number of studies that have been undertaken showing that the pre movement times can constitute a significant portion of the total evacuation times and in many cases can be greater than the travel time. Research undertaken by David Purser (*Comparison of Evacuation Efficiency and pre-Travel Activity Times in Response to a Sounder and two Different Voice Alarm Messages*) assessed the pre-movement times for a shopping centre, multi-story office and university teaching lab. He discovered that the pre-movement times could account for up to 80 percent of the evacuation time. The ability to reduce this component can therefore significantly reduce total evacuation time.

When considering which type of detection and alarm system to specify for a building the fire safety engineer must consider the holistic fire safety strategy. British Standard PD 7974-6 provides an overview of potential pre-movement times for different occupancy types. Among other factors it makes a correlation between the management levels, the type of alarm system and the length of the pre-movement time.

As a simple example of its application, in the United Kingdom under the recommendations of the building regulations low-rise office buildings may be provided with just a manual alarm system. Upgrading this system to an automatic detection system is a common variation used to substantiate extended distances of travel beyond those specified in The Building Regulations for England and Wales guidance document for fire safety, Approved Document B and allows justification based on the significant potential for reduction of alarm and pre-movement times within the building.

Taking this a step further, the engineer should also consider the benefit of providing a voice alarm system against that of a sounder system that omits just a series of tones. Research, again undertaken by David Purser, has shown that recorded voice messages form shorter and more reliable pre-movement times than a sounder system. His research also indicated that the use of shorter messages helps reduce the pre-movement times still further.

Once specified, maintenance of the alarm system and staff training in the effective use of the system and the building's evacuation strategy become critical. The Chicago Cook County Administration Building (CCCAB) was a non-sprinkler protected 36-storey building office block in which, in October 2003, a fire starting within a storage room on the 12th floor resulting in six fatalities and injured dozens of people. An assessment of the CCCAB Fire by Guylène Proulx (*Occupant Behaviour and Evacuation during the Chicago Cook County Administration Building Fire*) discovered that the pre-movement times where on average five minutes and varied between effectively zero and 30 minutes, depending on the individual questioned. The total evacuation times ranged from two to 37 minutes and the average total evacuation time was 11.5 minutes.

The pre-movement times therefore accounted for approximately 43 percent of the total evacuation time. The conclusion of the investigation show that just 20 percent of the population of the building understood the phased evacuation procedures of the building and that the public address system relayed incorrect information throughout the building. This resulted in a level of confusion, leading to the beginning of a 'milling process' where occupants would move around the office and discuss the message with their colleagues. These issues ultimately prolonged the pre-movement time.

Effective maintenance and training in the use of the evacuation strategy stem from strong levels of management within the building. The use of trained members of staff in buildings where there are a number of unfamiliar, sleeping or incapacitated occupants is particularly important. On a recent RAWFire project at a hospital in Sydney we were asked to remove the requirement for an alarm system within the intensive care wards and operating theatres to reduce distress to patients and members of staff. This was achieved by enhancing the levels of management and ensuring that a fire warden with a Stage One alert was appointed to ensure that the high dependency areas were notified and cleared in the event of a fire.

The use of a trained warden in this manner is another effective way of reducing the pre movement times within a building and should be considered an integrated into the evacuation plan for other lower risk occupancies. When investigating evacuation times from a London Underground Station, it was discovered, again by Guylène Proloux, that when the evacuation signal was reinforced by an authoritative and well informed figure, the occupants were more likely to respond and in a more timely fashion.

Clearly it is not always necessary to provide the bells and whistles approach of an automatic fire detection system with a VA/PA system or to provide the level of management you would expect to see in a health care environment. However a fresh approach and consideration from first principles of the benefits of providing an enhanced detection and alarm system can provide major benefits. These systems when designed, installed and maintained correctly and used in conjunction with effective management procedures and training may provide the additional pre-movement time saving necessary to ensure occupants egress safely before the onset of untenable conditions. **APF**

Roderic Jones is a Director of RAWFire UK, a subsidiary of Australia-based RAWfire Fire Safety Engineers

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Do you ever practice your skills at night?

What a Difference the Day Makes

Ian Dunbar

Holmatro Rescue Equipment

Think back to the last time you did some practical extrication training. It was in reasonably nice weather, probably not raining and not too cold. I also bet it was during the day. Of course it was, it makes sense. It is a safer, warmer environment, everyone can see and things are generally a whole lot easier for all concerned, especially the rescuer who volunteered to be your casualty. But the very reasons you chose to do your extrication training during the day in fine weather, is the precise reason you need to think seriously about how you prepare for extrications that you attend in the middle of the night, when the elements are not so desirable.

There are many elements that make the process of rescue at night in bad weather more challenging than during the day when the sun is shining and the temperature is favourable, but let us focus on the following two:

- Reduced Visibility.
- Reduced Temperature.

Reduced Visibility

It will come as no surprise that in nearly all parts of the world, night time is darker than day time (of course there are exceptions to this rule). This fundamental difference will greatly affect your ability to operate at the same pace and still retain the level of safety required on scene; in fact actually locating the scene may be your fist problem.

As soon as you have located the scene and you do arrive, reduced visibility makes your initial assessment more difficult and therefore more time consuming. Recognising and managing risk is far more difficult when your ability to see is diminished. Identifying the fuel type of the vehicle and

Carrying handles with integrated lighting illuminate the working area

locating casualties will prove more problematic, as will stabilisation due to the structural parts of the damaged vehicle being harder to establish. Managing glass will not be a straightforward task. During daylight glass fragments can easily be seen and dealt with, reducing risk to all on scene, but in the case of no daylight, this will be more difficult.

Identifying and treating the injuries sustained by your casualty is now far more difficult. Your primary survey relies on the ability to look, listen and feel. With one of your senses partially removed, casualty care becomes far more complex, and again time consuming. (Remember, if there is a possibility of ejection from the vehicle, locating this casualty will be very difficult and potentially hazardous to rescuers.)

Assessing the level of mechanical entrapment and formulating an extrication plan is compromised by your inability to readily see your casualty's extremities. This makes instances of feet entrapment, for example, more difficult to establish. Finally, once you have overcome the problem by establishing on-scene lighting, you will soon see that you are operating in your own, or someone else's, shadow.

Exposure of interior trim to establish safe areas to cut is going to take more time, and delay your ability to create space. Once this is complete, the sharp edges you have created pose a greater risk at night and must be made safe as soon as possible. Many injuries sustained by rescuers on scene occur when the extrication is complete and the initial adrenalin rush has started to subside. At night the risk is greater as the hazards are not as readily identifiable.

So how can you ensure you are ready for rescue at night?

- **Preparation**
  You must initially discuss the implications on your approach to extrication in a theoretical session. Exactly what problems does lack of daylight create? You cannot deviate from your standard, well-rehearsed approach, but you must be prepared for each phase to be a little more complex, challenging, and as a consequence, more time-consuming and with a higher degree of risk. In order to recoup some of this time we need to work intelligently, that is where your tools come in.
- **Tools**
  Tools that are quick to set up, light and portable and can be changed under flow will always reduce time on scene. During the night this is even more crucial. Tools with integral lights allow illumination of the desired area (improving safety and speed) and means that you need never operate in your own shadow. Tools that are silent in operation (with low noise pumps sited away from the vehicle) mean that medical care is not compromised and on-scene communication is easier.
- **Training**
  Once you have the theory and tools in place, why not arrange a training session at night? Remember that the fundamental principle that applies to any training event is safety, so walk through each phase of the extrication process and see what practical problems arise, then discuss and work out solutions.

Reduced Temperature

In general it is fair to say that night time brings reduced air temperature. Of course not all areas in the world have a marked difference between day time and night time temperatures. Some areas of the world for instance, may stay below freezing day and night for sustained periods of the year. Warmer climates often see a very small temperature differential during day and night. But the issue here is not really the temperature differential between the two parts of the day, but about the rapid exposure to a reduced temperature, for both the rescue team and, more importantly, the casualty.

We must consider that before the impact the occupant of the vehicle would have been warm and comfortable inside the passenger compartment, where the environment is temperature controlled. Immediately following the impact however, the occupant is now faced with exposure to the outside environment and faces rapid loss of body heat. This is due to the loss of glass from the windows during the collision, the cabin will no longer be temperature controlled and more critically they are not suitably dressed for being outside.

From a medical point of view, exposure to cold, and in particular hypothermia, coupled with trauma is not a good mix, especially when your casualty is suffering from an internal or external bleed. A loss of body temperature and shivering reduces the body's ability to produce fibrinogen, a major ingredient in the blood's clotting process. At the same time, the affected cells within the body start to die; this produces lactic acid, which inhibits the formulation of fibrinogen.

So now we have a casualty who is cold, bleeding and whose blood is becoming acidotic. Unfortunately, because they are bleeding, they are becoming colder and the cycle continues. With such a condition where the blood's ability to clot is impaired (coagulopathy) maintaining body temperature is vital.

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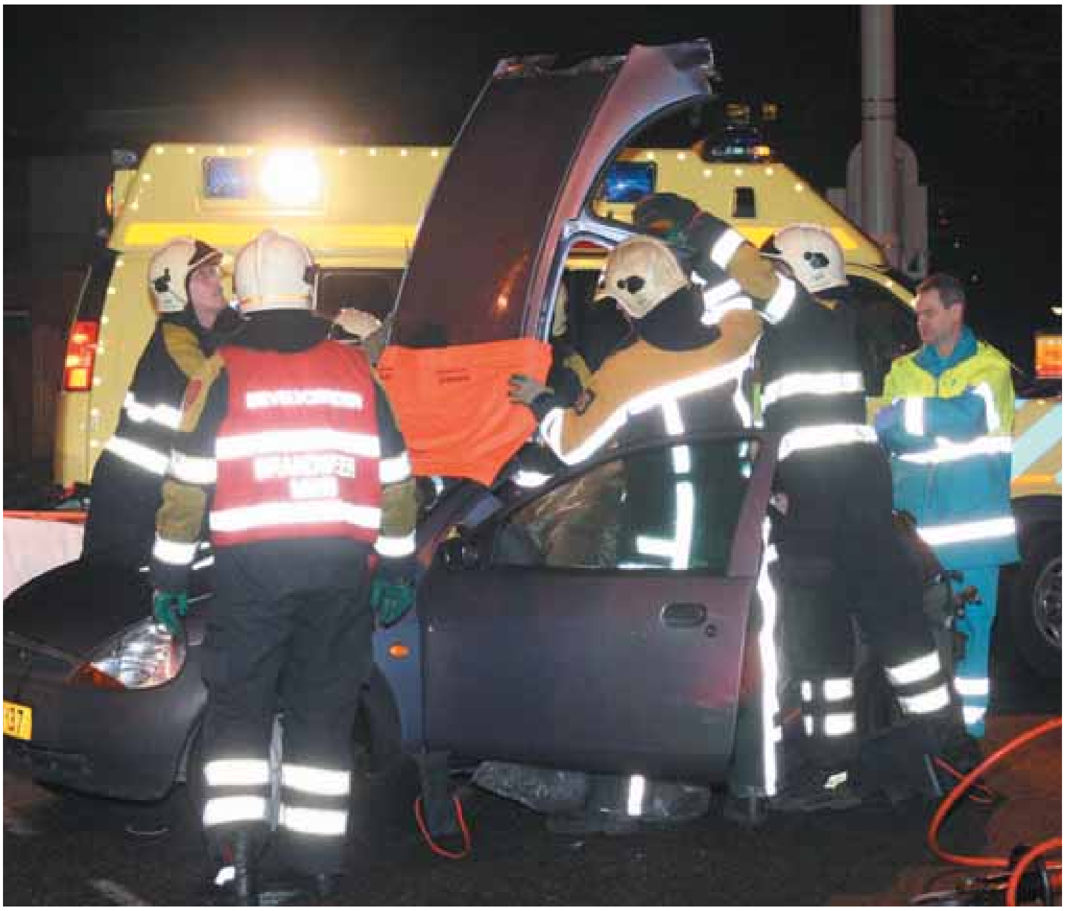

A roof flap limits the exposure of your casualty

So what can you do?

- **Approach**

  Well, just like dealing with the previous problem, you must look at how your approach to extrication may affect this issue. In the first instance keep things simple. Body temperature in this situation is affected by two major factors; exposure and time. Your efforts must concentrate on keeping both to a minimum, while still extricating in a safe manner.

  Can we reduce the casualty's exposure to the environment?

- **Think smarter**

  The extrication process means we have to access the vehicle and create space with which we can safely remove our casualty without making their injuries worse. This process by definition will mean we are exposing them to the elements, so we must think smarter. Simple things like, is it possible to position your vehicle in such a way that you reduce the effect of the wind, while not affecting crew safety?

  If you use medical blankets, is it possible to use more than one?

- **Glass Management**

  You may also have to consider how and when you manage glass. When you start to formulate your plan, keep in mind the issue of exposure. For example, if your final extrication plan is a roof removal, consider making this a roof flap. This gives two advantages. Firstly (if you are flapping the roof forward) it means you do not have to cut a laminated screen (creating a great deal of glass dust) and secondly, your cuts can be put in place and the roof flapped at the very last moment, just before the physical extrication takes place. This limits the exposure of your casualty. These are just simple things, but if considered they can make a huge difference. Remember, the effect that exposure has on your casualty is a consideration for every extrication, night and day.

Conclusion

Realistic training is nothing new. However sometimes we miss the fundamental elements and subtle differences that actually do make it truly realistic.

When I think back over my career I cannot remember even discussing the differences between operational extrications at night compared with those during the day (and I certainly never did any practical training), but if you stop and think about it, it is a very different dynamic. It is not just an issue of light versus dark but the temperature night time brings can have a huge effect on the condition of your traumatically injured casualty. Rescue at night will nearly always mean a prolonged extrication due to the increased complexity brought about by the environment. That time has to be reduced by crews working smarter and more use of simultaneous activity (multiple tasks being carried out at the same time) and making the most of their intelligently designed tools that allow for quick and easy operation.

The most important point is to acknowledge that extrication at night increases risk to rescuers and victims alike and figure this into your plan. Preparation and training will reduce these risks and allow you to focus on the process of rescue, after all, that is why you are there. **APF**

Ian Dunbar is Rescue Consultant at Holmatro Rescue Equipment

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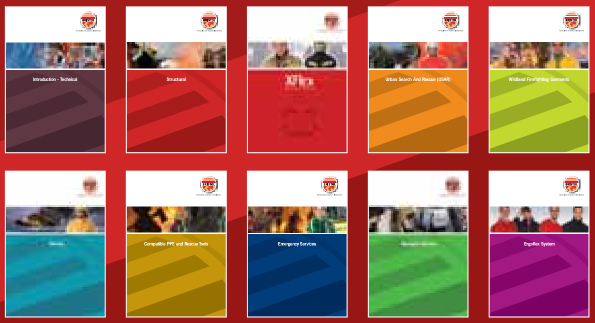

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TÜV SÜD

Fire Research

How New Knowledge is Changing the Training Needed for the Job

David Bruce

Bushfire Cooperative Research Centre (CRC)

Firefighter training has always been more than just learning how to douse flames. It is also about fire science, work safety, team skills and communication. For bushfire and wildfire fighting, there is the added need to understand the basics of fire behaviour under different fuels, weather and terrain, and the ecological impacts of fire in varied landscapes.

In recent years new knowledge is appearing that is changing the basic requirements of what it means to be a firefighter or a manager of fire operations. The research is showing that these professionals need to be armed with the latest knowledge in order to make better decisions on personnel tasks, resource allocations, and communications with both agency staff and the public.

Over the last decade fire managers and firefighters in Australia have had their work examined by numerous fire inquiries, several parliamentary inquiries at both federal and state level, civil and criminal litigation, and a Royal Commission. In the light of such extensive post-fire analysis, the need to be informed by the very latest research is more urgent than it has ever been. This is true for firefighters and fire managers across rural and urban environments, and even those managing other natural hazards.

The Bushfire Cooperative Research Centre (CRC) began in 2003 in Australia, at a time when the industry saw a great need to draw together a range of research programs across many research institutions into a network of shared learnings. Much of this research is focused on bushfire fighting but its applicability to structural fire and other natural hazard operations is apparent. Through the development of education and training, technology transfer and knowledge networking programs the Bushfire CRC has supported the broader fire and emergency management industry to better manage risk.

A research adoption strategy has ensured that research outputs are founded in rigorous scientific publications and are properly managed through to industry adoption, much of it through training and education programs, but also through a range of publications, course materials and online tools and guides, as well as workshops, seminars and field trips.

The following is a brief summary of several Bushfire CRC research projects that are forming the basis of training programs for fire managers and fire fighters.

Fire Behaviour

Firefighters and fire managers need to understand the interactions between fire, fuel, weather and topography. Factors identified and expanded upon in this research include rate of spread, flame height, intensity and spotting for both wildfires and controlled prescribed fires.

The research work included field validation of the findings from Project Vesta results in southern Australian fuels. Project Vesta was a comprehensive research project with various partners investigating the behaviour of bushfires in different fuel ages and structures during dry summer conditions. The research produced a field guide and reference materials that comprise essential training content for end users.

Outcomes from Project Vesta have been integrated into firefighter training in Australia. The research identified the Dead Man's Zone – now an essential component of any firefighting training manual. This refers to the area directly around a fire that is likely to burn within five minutes given the current wind conditions or an anticipated change in wind direction. The distance this zone extends from the fire-front is highly dependent on terrain, wind speed, fuel type and composition, relative humidity and ambient temperature, and can range from under 100 metres to well over one kilometre.

Complementing this work, a program was developed to predict the movement of fire and help determine which communities need to be warned and where to send resources to minimise the impact. The Phoenix RapidFire program generates a map with a visual representation of a fire moving across the landscape with input from environmental details such as the height and slope of the land, vegetation type, road proximity and fire history of the area.

The fire's impact is then estimated based on fire characteristics and the values and assets of the landscape, such as houses and agricultural areas. The state of Victoria began using this program operationally in the 2010-2011 fire season and a national training and awareness campaign is underway. Along with Project Vesta, Phoenix RapidFire is a component of the Fire Behaviour Analysts basic training course in several Australian states.

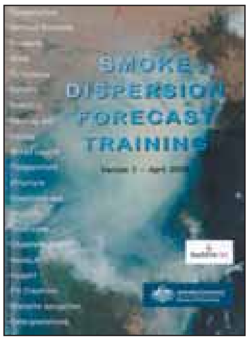
The program has the potential to allow fire managers to provide hours of warning of a fire approaching within just minutes of it being discovered. It is designed to show the progression of fire across an entire state and not just a local area and therefore the firefighting resources can be most effectively allocated. Although other fire behaviour models exist, Phoenix RapidFire has the ability to respond to changing factors in the environment such as weather and fuel.

Fire managers also use Pheonix RapidFire to simulate the positive effects that a fuel reduced zone can have on the progress of a wildfire. It can also be used for fire management planning and to inform land use planning decisions.

Smoke Plume Dispersion

The impact of smoke from prescribed and fuel reduction burns, wildfires and structural fires on community health is an area of growing public concern. To minimise the impact of smoke on the community a predictive model was sought by fire managers.

This project enhanced the current operational high-resolution prediction models to provide forecasts for wind and temperature fields and the location and strength of the smoke plume. A self-paced, computer-based, interactive training package is used for the training of fire managers. The predictive model is now delivered online, and includes operational capabilities for users to interactively specify the ignition sites of planned burns. This tool is routinely used by fire managers across southern Australia to plan prescribed burns and was used during the 2006 Commonwealth Games in Melbourne to ensure smoke from autumn burns did not impact on the events.



SMOKE DISPERSION FORECAST TRAINING

This research assists the prediction of transport and dispersion of smoke from an urban or rural fire. It predicts concentrations of smoke particulates at locations affected by the smoke plume. Outcomes are helping fire management planning and training, by allowing modelling of smoke movement from potential sites of controlled burns.

Fatigue, Hydration, Fitness for Task

Firefighter safety is a high priority for fire agencies and new research is better informing trainers on how fire managers can make better decisions to keep their crews safe and healthy. Battling fires in hot and smoky conditions is at times unsafe and unhealthy. Firefighters are subject to stressful conditions, in which fatigue and work capacity is affected by the erratic nature of work and rest cycles and the need for food and liquids.

Work environment issues plus physiological and psychological pressures are a constant factor. Ageing populations, demographic variety and the physical condition of firefighters presents a challenge to emergency service agencies in improving safety conditions in hazardous situations.

This project provided a quantified picture of the total fireground environment. Importantly, it provided a unique insight into the level of fitness of current firefighters and made scientifically-based recommendations on the level of fitness required by bushfire fighters over a range of common tasks.

To investigate the physical demands of bushfire suppression, the research measured volunteers' heart rate, limb movement, and oxygen consumption during standard fireground activities, including unreeling and reeling fire hoses and advancing charged hoses. To measure the health and fitness of volunteer firefighters the research also measured important health indicators including resting blood pressure, blood cholesterol and glucose levels, and body fat levels, and cardiovascular fitness.

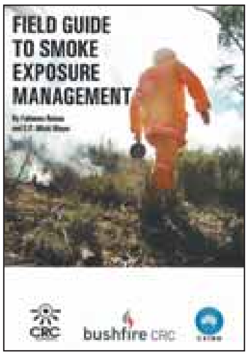
Another study investigated the effect of hydrating firefighters before, during and after live bushfire fighting shifts. This ground breaking work is now the basis for emergency service agencies to provide scientifically valid training strategies for firefighters.

Smoke Toxics

Previously, there was little knowledge of bushfire firefighters' exposure to such toxic air pollutants as carbon monoxide, respirable particles, polyaromatic hydrocarbons and dioxins.

This project tackled this important occupational health and safety issue by identifying key toxic pollutants, evaluated their concentration and provided the tools and techniques to measure, evaluate and control the exposure of firefighters (and to some extent communities) to these substances.

The outcomes of the research, including a detailed *Reference Guide* and a *Field Guide* to smoke exposure management, have improved the training for the management of air toxics exposure. The aim of the guide is to provide training and advice to fire line supervisors and managers on the fire ground so they can quickly recognise high exposure risk situations and undertake mitigation strategies so that their firefighters remain safe.


FIELD GUIDE TO SMOKE EXPOSURE MANAGEMENT

Decisions Under Stress

Why do good firefighters sometimes make poor decisions? This research sought to improve training for better decision making.

Firefighting, despite heavy reliance on fire prediction, hazard models, fire control and suppression technologies, is ultimately a human activity. It requires individual firefighters to form risk assessments and initiate courses of action. It requires that individuals be aware of, and give adequate attention to, the safety implications of any decisions they might implement.

The researchers interviewed many firefighters coming off the fire ground over several fire seasons, conducting detailed post-incident debriefings of firefighting personnel (across all levels of rank) involved in incidents, conducted controlled experimentation using computer-generated safety threats (using a simulator, Networked Fire Chief), and developed and tested methods for presenting fire related information and for training to reduce safety-compromising behaviour.

The researchers identified around 20 individual and ten small group human factor issues that appeared to be relevant to safety on the fire ground. This included the issue that firefighters were reluctant to change a decision once it was made, even though something else – such as moving fire trucks elsewhere – might be more effective. Other issues involved mental overload, underestimating the situation, role confusion, and inconsistencies in trusting a range of information sources.

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Research also specifically looked into how firefighters think about worst case scenarios and how better training might develop the skills to consider their occurrence. These kinds of extreme events are rare and so the possibility of them occurring can be overlooked by emergency service workers, with tragic consequences.

Air Operations

Despite the significant role of aircraft in bushfire fighting at the time of the establishment of the Bushfire CRC, there was no significant research into how appropriate, useful and effective they were. One of the first big tasks undertaken by the Bushfire CRC was to initiate that research that would better inform training for aircraft firefighting operations.

The research looked at many scenarios, including such issues as single or multiple "drops" on fires and whether and when to drop water or chemical-based retardants. It found that aerial suppression drops were of limited value without timely follow-up by firefighters on the ground, but when used properly, could enable ground firefighters to contain fires more quickly.

Among items useful for trainers, the research led to the production of a *Fire Containment Guide*, an online *Fire Containment Calculator* and a *Drop Effectiveness Guide* to help fire managers assign and use fixed-wing aircraft and helicopters effectively.

Fire Weather

Training in the analysis and understanding of meteorological data is fundamental to predicting fire danger and fire behaviour on a range of timescales from seasonal to very short range.

This Bushfire CRC project improved the operational utility of fire weather forecasts and outlooks, by providing better knowledge and understanding of wind, temperature and humidity structures and distributions. The outcomes provide a range of forecast products tailored to the fire weather forecaster. These have included gridded weather and soil indexes for better fire weather forecasting; a better understanding of wind changes and links to "blow up" days; a better understanding of atmosphere stability impacts on fire behaviour; and breakthrough work on the nature of dry lightning.

Another research team has contributed to fire management training by identifying several processes known to influence fire behaviour in mountainous regions, ultimately determining the size of a bushfire and the level of risk to assets. These processes include the interaction of terrain features, climatic conditions and local weather patterns. Although the same processes influence fire behaviour elsewhere, new understandings on the unique nature of the interactions in the high country is contributing to better training for fire management in these areas.

Identifying Arson Trends

Work on the motives and patterns behind bushfire arson produced practical information that police, fire services and land managers use to target investigations and prevention campaigns. By knowing where and when bushfires are most likely to be lit, and who is likely to be lighting them, resources are more effectively targeted.

An initial literature review on bushfire arson showed its links to urban arson, the age and background of arsonists, and the times and places of offences. This review is essential reading for fire agencies and law enforcement authorities in training their staff to combat arson in bushfire areas.

IMT Structures & Decisions

How is an Incident Management Team best established when its members come from a variety of agencies, each with its own mind-set and viewpoint about making decisions? This project gained a sound understanding of communications flows through the Australasian Inter-service Incident Management System (AIIMS) structure – used by fire and emergency management agencies in Australasia.

Timely interactions and collaborations within and between both same-site and geographically isolated teams are crucial for achieving seamless information flow and coordinated effective action. The research has led to a better understanding of the ways in which incident management teams work together, a better understanding of how information flows through organisations and the way knowledge is managed before, during and after incidents and a better understanding of what enables and constrains successful IMT operations and information flow.

The research indicates that the current incident control systems work well under routine emergency events but are strained under escalated conditions, when emergencies are complex, where there are high numbers of people involved, and where there are multi agencies involved. This has a direct impact on training programs for incident management, which need to differentiate between the type and scale of an incident.

Training Resources

Finally, a new AIIMS Training Resources Kit has been completed this year for training personnel in the application of the system across all hazards.

A significant component of this new training kit is the inclusion of research findings from the Bushfire CRC. These findings have resulted in five additional sessions being included in the training to address the topics of:

1 Human Factors and Incident Management.
2 Incident action planning.
3 Lines of Communication.
4 Incident Information.
5 More Thinking.
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David Bruce is Communications Manager at Bushfire CRC

For further information, go to www.bushfirecrc.com

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DDST-3P4	5.5	14885	18", 4-Blade	82 lbs.	23" X 23" X 21.5"
DST-3P4-L*	5.5	14885	18", 4-Blade	85 lbs.	23" X 23" X 21.5"
DST-3P4-6.5	6.5	17000	18", 4-Blade	91 lbs.	23" X 23" X 21.5"
DST-9P4	9	17500	20", 4-Blade	115 lbs.	26" X 23" X 21"
DST-13	13	22000	24", 4-Blade	136 lbs.	30" X 28" X 24"

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Proposed ICAO Fire Test Changes Compromise Fire Safety

Mike Willson

Willson Consulting

A divergence in safety standards, particularly when it is from the same organisation, is uncommon. Rarely do we see proposals that push the boundaries and increase the difficulty of passing a new higher standard level, while at the same time seeming to "dumb down" the requirements for passing the current standard levels, by making them considerably easier to pass. How does this affect users of the standard trying to distinguish between products approved before and after these changes? Many are understandably concerned over the impacts of these changes on Airport Rescue and Firefighting (ARFF) safety.

The generally accepted proposal of a safety standard is to increase stringency over time to provide better regulation and improved protection and safety, for those to whom it relates. New or upgrade standards usually arise once a solution has been achieved, proven and verified by extensive testing. It was therefore exciting to find the International Civil Aviation Organisation (ICAO) trying to reverse this process, raising the bar on firefighting foam standards, by seeking a higher performance level, ahead of the solution.

These proposals have challenged the fire industry to develop even higher performance products that could help airports better address the combined problems of increasing passenger traffic, larger fuel loads and potentially more aggressive fires from using larger "super jumbo" jets like the Airbus A380. This aircraft can accommodate up to 800 passengers on a single flight, almost double the practical maximum for a Boeing 747-400 "Jumbo" jet. All survivors will need rapid evacuation to avoid being overcome by noxious smoke in a fire incident.

New Level C Test Proposed

The attraction of this proposed new Level C test is that it would permit substantially reduced quantities of foam agent and water to be available on fire trucks to meet existing airport response requirements. This has substantial cost saving implications in terms of fewer trucks, lower staffing levels, and potentially cheaper vehicles as a standard chassis could be used due to the reduced payloads projected. Required performance criteria could potentially be achieved within a non-specialist, non-custom built truck category at substantially lower costs. These resulting economic incentives are significant for airport operators, particularly larger category airport hubs. They are expected to embrace this new Level C requirement once scheduled implementation occurs in November 2013, assuming member States ratify it after the discussion period, expected to start in July 2012.

Requirements for Level C

Key proposed performance changes hinge on a substantial lowering of the firefighting foam application rate on the Avtur Aviation Kerosene test fuel. The test rate is being reduced by 30 percent from 2.5L/min/m^2 at current Level B standard, to 1.75L/min/m^2 while using the existing UNI 86 aspirating test nozzle, so the foam quality requirements remain unchanged. The fuel and water base are increased by 57 percent to 157 litres each, and the circular fire tray area is also increased by 63 percent to 7.32m^2.

Key objectives of this proposed C level, mirror those for existing Level A and B fire tests. That is:

- To extinguish the test fire within 60 seconds.
- Achieve less than 25 percent foam blanket burn-back from exposure to heat and fuel within 5 minutes from burn-back pot ignition.

It is anticipated that this proposed Level C anticipates a 25 percent reduction in practical application rates to around 3.5L/min/m^2 delivered by ARFF services, from the current 5L/min/m^2 of fire area commonly adopted by ARFF services in much of Europe, the Middle East and Asia. Achieving this Level C criterion requires at least a three-fold increase in fluorotelomer surfactant levels over existing Level B approved AFFF foams, according to Solberg's Luc Jacobs presentation at the UK's 2009 Reebok Foam Conference entitled "ICAO Level C Performance", which emphasises just how tough it is to pass.

The generally accepted principle of a safety standard is that it increases stringency over time to provide better regulation and improved protection and safety, for those to whom it relates. However, safety is being compromised by the ICAO's proposed fire test changes.

Can Multiple Finishing Posts Ever Be Acceptable?

Any standard requires a clear pass/fail criterion to be of value. This provides a meaningful benchmark to those expected to use it and make decisions based on its repeatability.

This Level C fire test requires fire extinguishment (meaning no flames) within 60 seconds. However there is a worrying note suggesting that small flickers between the foam blanket and fire tray are permissible (meaning that the fire is not extinguished)! It suggests these flickers should not exceed 25 percent circumference of the tray and

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must be extinguished before foam application stops at 120 seconds.

How and why extinguishment should suddenly shift from 60 seconds to potentially 120 seconds and include existing Level A and Level B fire tests is not explained but, in future, it would allow substantially inferior foam products to pass, seriously diluting the current standard and causing major confusion for ARFF services. The presence of persistent flickers in a fire test is evidence of non-extinguishment and indicates a significant risk of re-ignition during an emergency. It effectively doubles the required extinguishment time, meaning that the quality of foam meeting this standard is potentially halved, defeating the primary objectives of this standard: to raise the bar; and clearly separate acceptable, from unacceptable.

The acceptance of flickers in the ICAO Level C fire test offsets the increased strength of the test from the larger fire and lower application rate, so what does it achieve? It jeopardizes the goal of Level C, to encourage the development of more effective and efficient foam agents, for use in aviation. We understand only two AFFF foams have so far met this 60 seconds extinction criteria at Level C, but it is not clear whether these products were allowed to pass the test with flickers, or not.

Perhaps this dilemma, triggered the idea of allowing flickers within these proposals? Alternatively, perhaps it indicates this test was designed hurriedly to allow potential cost savings by airport operators to be quickly realised, rather than identifying key parameters needed for safety improvements with clear pass/fail criteria, so everyone can benefit.

Fixed or Moving Foam Delivery

Another area of concern includes the fixed position nozzle. Although reducing human interference during testing, this potentially makes the test harder, but the results more comparable. It does not easily replicate practical firefighting where nozzle movement around the fire area is instinctive and ubiquitous. Maybe it helps build additional safety margin?

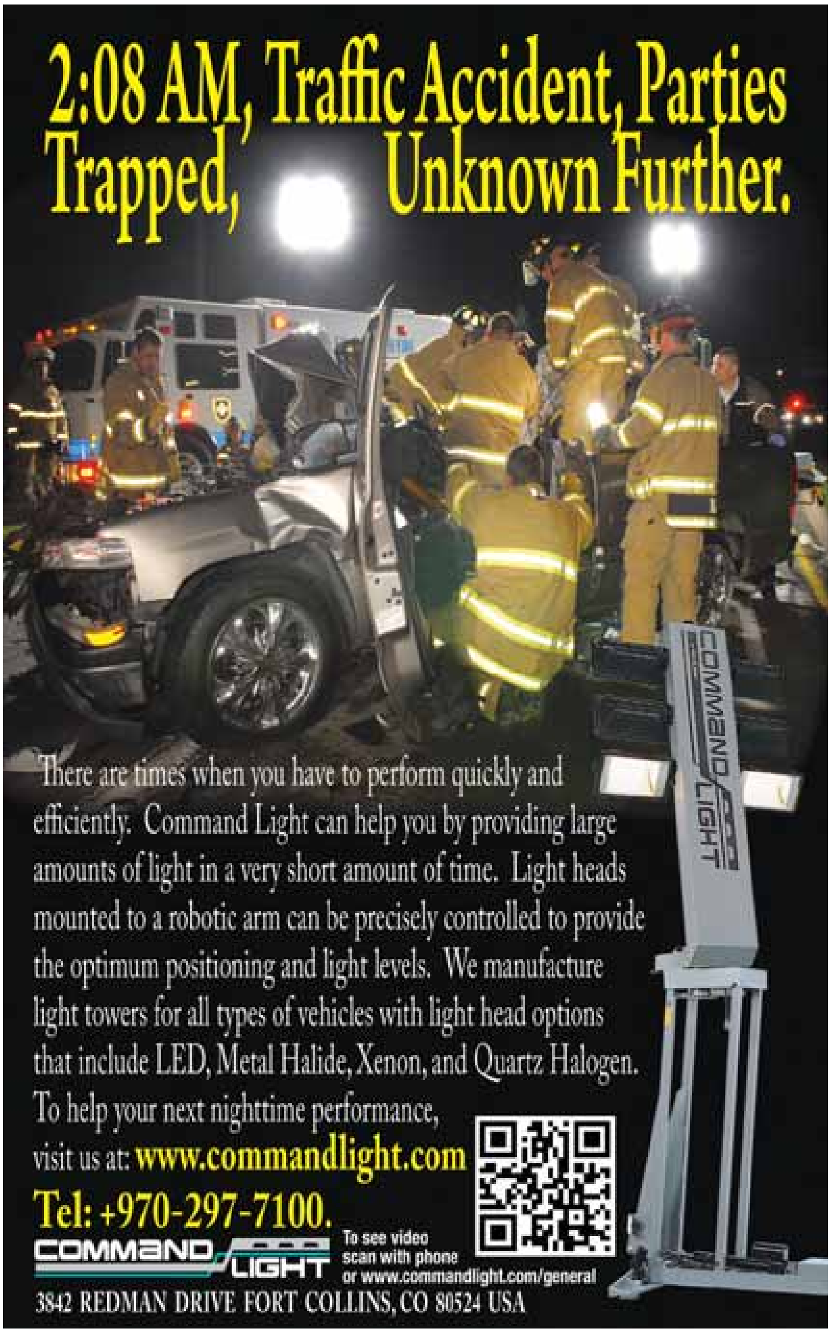
Extinction or No Extinction?

The Oxford English dictionary defines extinction as: *"no longer burning; out; quenched; has ceased activity; has died out"*. So how can persistent flickers after the defined 60 second extinguishment time possibly be acceptable? It is clear; the fire is either out, or still flaming. Any fire protection standard should recognise this as a fundamental distinguishing requirement.

A bigger concern is that allowing flickers at all levels substantially "dumbs-down" and weakens both well-established Level A and Level B fire tests.

Likely Impacts of Allowing These Flickers

Diluting the performance criteria by allowing flickers would allow previously unacceptable, less



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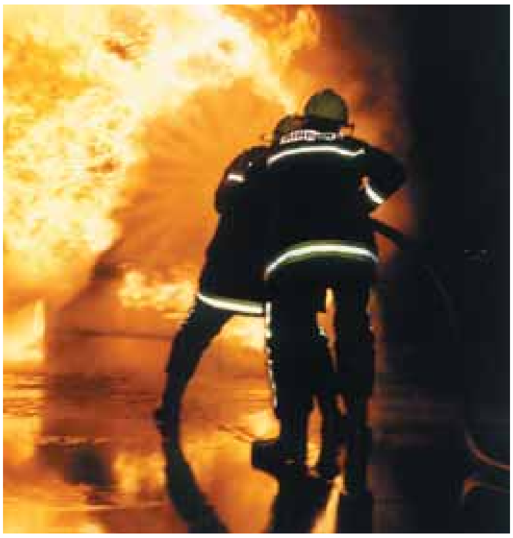
effective foam agents to meet ICAO standards and be used at airports worldwide. This has the potential to delay or prevent fire control and extinction in an emergency, unnecessarily increasing the risk to passengers, crew, and firefighters.

- **Unacceptable Quality Passes**
  Numerous currently unacceptable quality AFFF and Fluorine Free Foam (F3) concentrates at airports worldwide, could suddenly qualify as "acceptable" if these proposals are accepted. This could not only delay or prevent fire control and extinction in an emergency, but also increase the risk of unnecessary injury or death to casualties, passengers, crew, firefighters and other rescue personnel, with no justification. Can this be right?

- **Additional Foam on Trucks**
  Future foam purchasers may not realise these implications when they are suddenly offered much cheaper "approved" but inferior quality products, that no longer meet their expectations based on current ICAO Level B approved products. Using less effective foams should require additional foam and water resources to be carried on fire trucks, offsetting this lower performance ability, producing the opposite effect of what ICAO set out to achieve. Why?

- **Return to Mil-F**
  These changes may encourage a return to the US Mil-F spec. Currently only Mil-F spec. AFFFs are allowed to be used at all airports across the USA, which despite its many faults, at least gives clear pass/fail criteria.

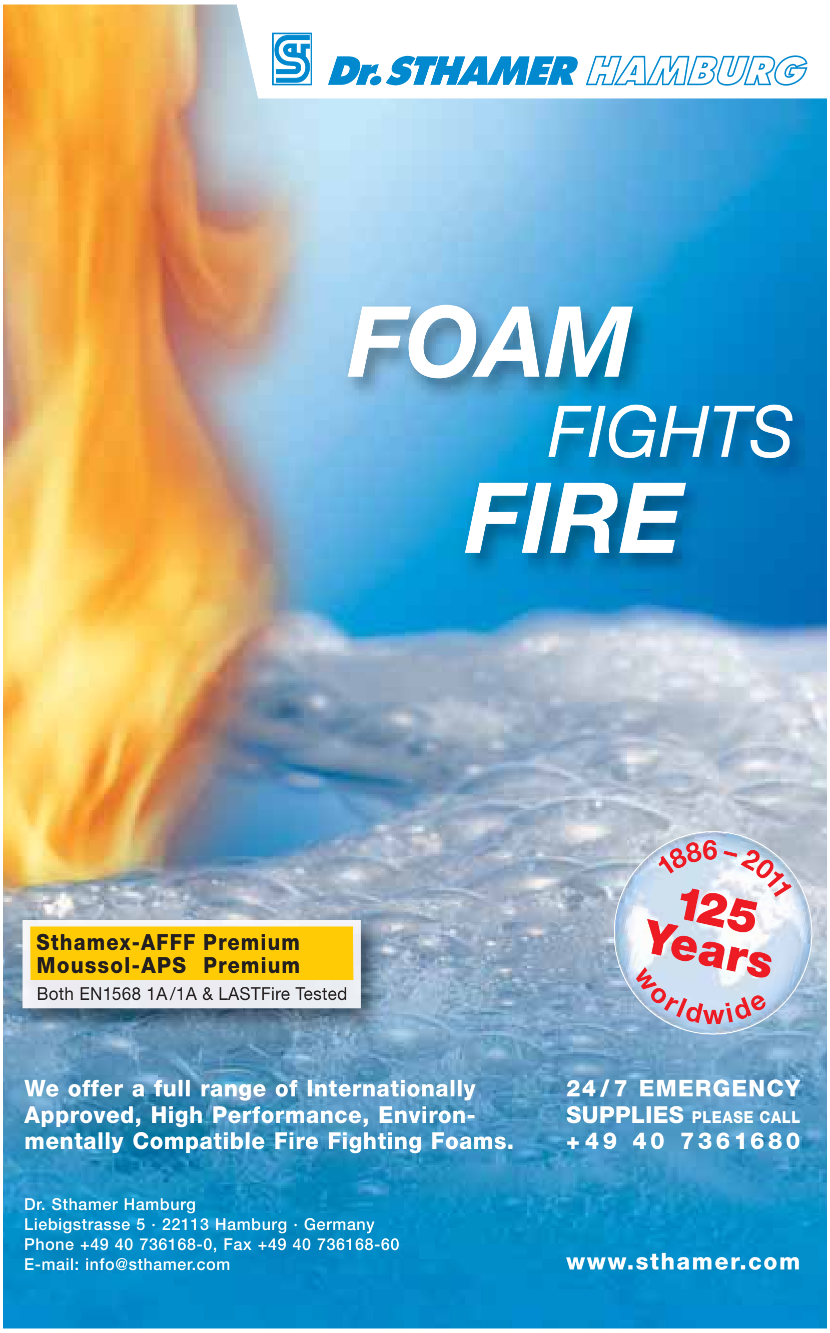
- **Increased Risk of Injury**
  Fires that would normally be extinguished quickly and efficiently within three minutes by consistent high performance foam concentrates, allowing passengers and crew to exit an aircraft safely and have the best chance of survival, may with these changes continue burning and struggle to put the fire out. Such delays in extinction could significantly increase the chances of unnecessary injury or even death to casualties, passengers, crew, firefighters and other rescue personnel, without justification. Why? How worrying is this for all of us passengers?



- **More Lives at Risk**
  There is a clear desire among several airport operators to be using Fluorine Free Foam (F3) but they are prone to sudden flashbacks and rapid re-involvement. So far only three F3 products claim an ICAO Level B certificate, although there are concerns in several circles about how this was achieved, since others cannot replicate these claimed results. With these changes allowing flickers up to 120 seconds, many other F3 and inferior quality AFFF products will suddenly be capable of gaining ICAO Level B certification, increasing the dangers of delayed extinction and sudden flare ups or flashovers, undoubtedly putting many more lives at risk.

High Ambient Temperatures Reduce Safety Margins

Of concern to firefighters is the margin of safety erosion forced by these changes, which have been



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traditionally maintained by these standards to protect firefighter and passenger lives. Many airports around the world permanently exceed the test ambient air temperature range of greater than, or equal to 15°C, which most will try to minimise. At higher temperatures foam bubble quality is usually reduced, fire extinguishing ability is frequently slower, and burn-back periods are regularly shortened, even with high quality products. Inferior products may not be capable of extinguishing fires at normal application rates under prevailing ambient conditions. Sudden flash-backs may occur quickly that could endanger the lives of firefighters and passengers alike. Human-induced global warming is likely to exacerbate these problems, as ambient temperatures continue rising.

Safety Impacts of Fluctuating Water Pressures and Water Quality

Fluctuating water pressures can also erode the safety margin of the foam. As pressure drops, inferior foam quality may be produced. Utilising lower quality foams may cause failure to extinguish or sudden flare-ups that could endanger lives. Poor water quality makes these problems worse.

Practical Fire Fighting Usually Relies on Inferior Foam Quality

Foam quality from practical nozzles often falls short of UNI 86 test nozzle performance. There appears to be no allowance in these changes to this reduced foam quality, resulting from the actual jet/spray nozzles and vehicle monitor streams normally used by ARFF teams around the world. Any safety margin that was provided by the current ICAO level B fire test could soon be eroded by allowing these flickers, putting more lives unnecessarily at risk.

Some foam types, notably F3, are not designed for use with non-aspirating nozzles and produce no film forming capability, which is often relied upon by ARFF firefighters for personnel safety. The standard should be addressing this in some way, possibly by having an additional non-aspirating nozzle test requirement.

Product Repeatability and Reliability

Insufficient consideration seems to have been given to the reliability and consistency we should expect for aviation applications. These should improve over time and be re-enforced by international standards. Allowing lower quality products with greater performance variation, contradicts the purpose of this previously well respected standard.

In conclusion, all ARFF firefighters and operators, airlines and airport management organisations should be concerned about these adverse impacts. Diluting the performance criteria by allowing flickers could allow previously unacceptable, less effective foam agents to meet ICAO standards and be used at airports worldwide. This has the potential to delay or prevent fire control and extinction in an emergency, unnecessarily increasing the risk to passengers, crew, and firefighters, and increase, not reduce, the amount of foam agent required.

Everyone's safety is being compromised by ICAO's proposed changes allowing these flickers.

We urge all readers to inform their member State representatives about the dangers of these adverse impacts, and request them to seek the removal of this proposed change to allow flickers at Levels A, Level B and Level C. A clear 60 seconds extinction time needs defining for all levels. This should achieve what this standard seems to be aiming for and we all strive towards, an enduring improvement to global aviation firefighting safety standards. APF

Mike Willson is a firefighting foam specialist

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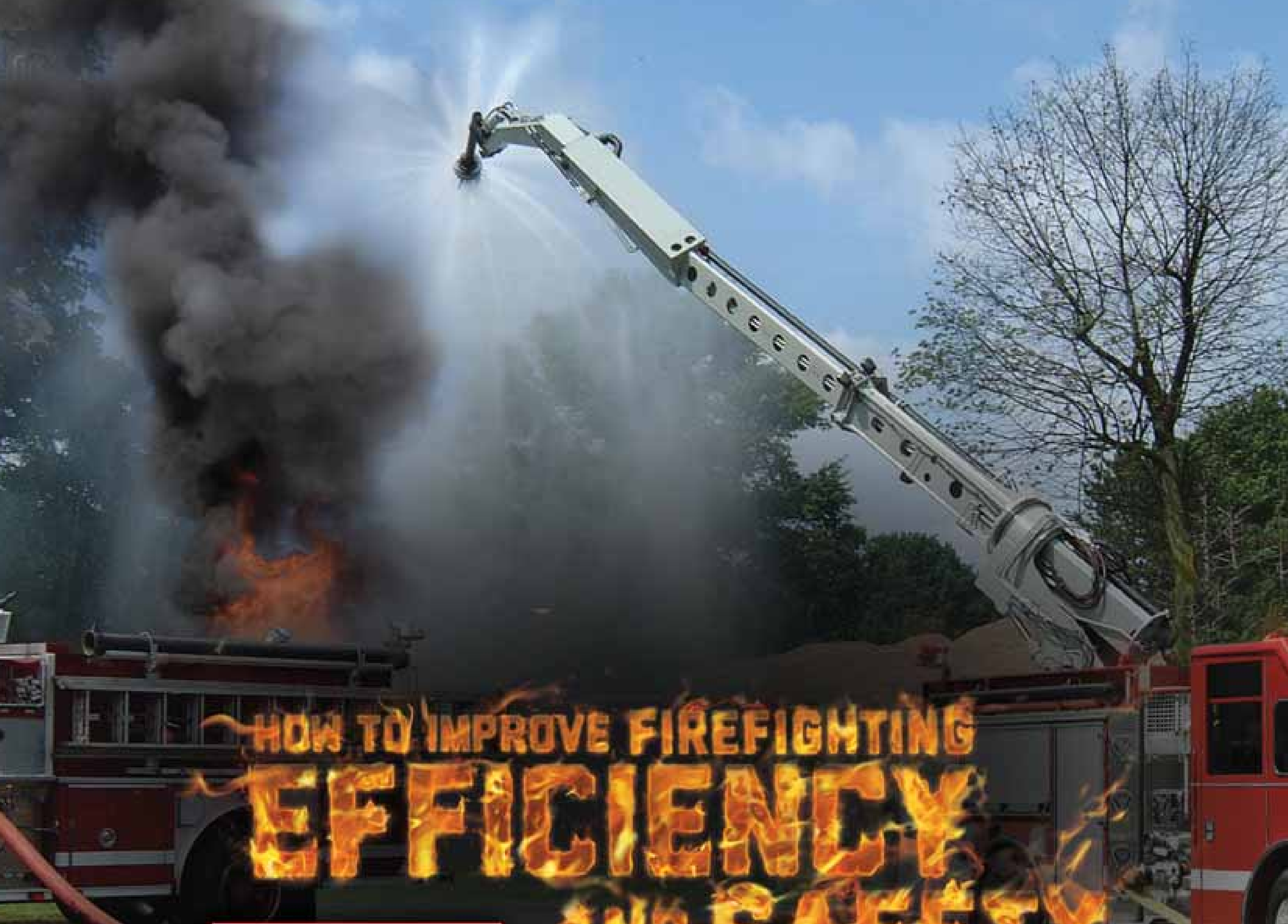

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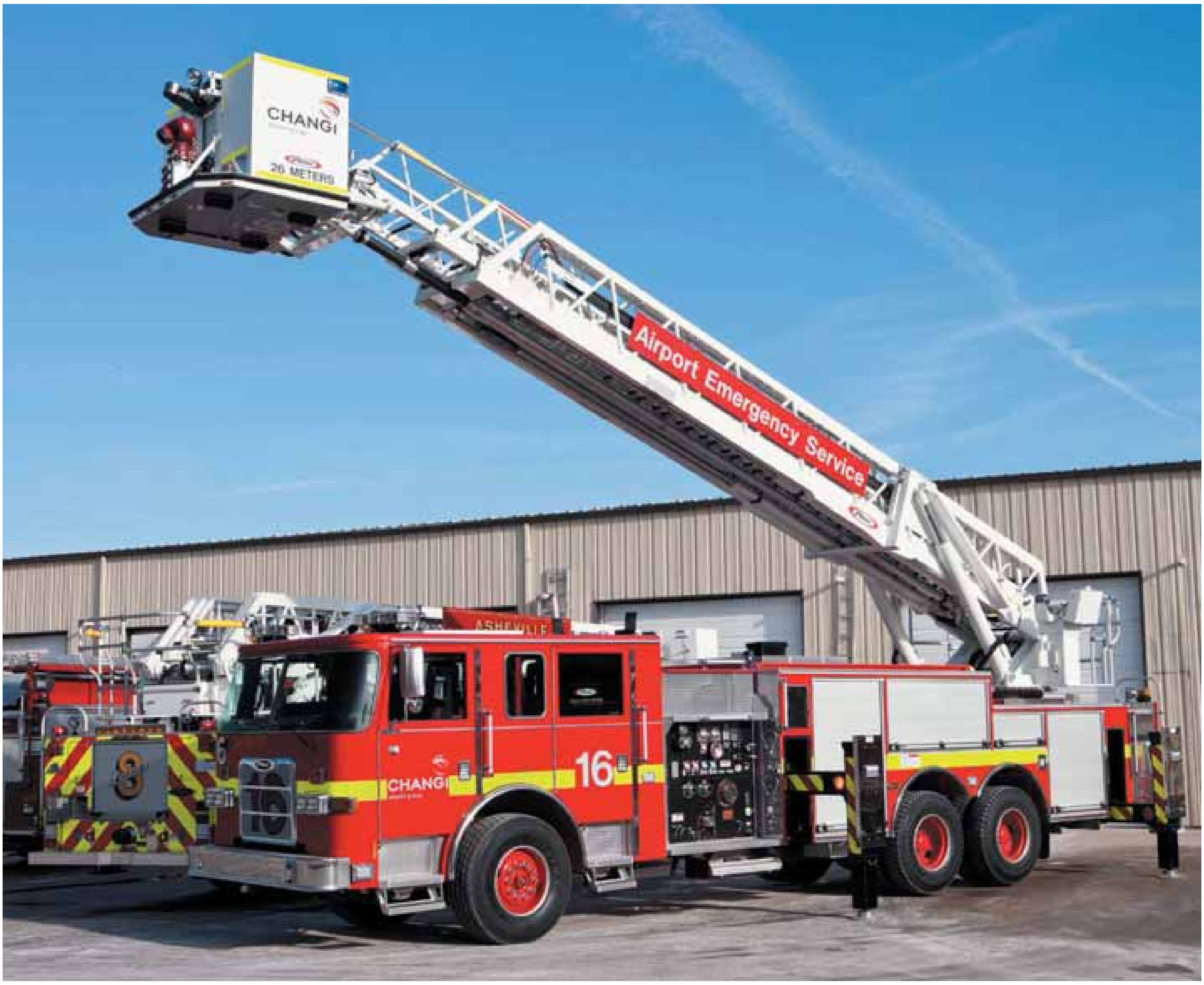
New Vehicles on the Block

Two of the world's leading firefighting and rescue vehicle manufacturers have recently delivered new vehicles to fire and rescue servicers in the Asia Pacific region.

Hong Kong Landings



PIERCE MANUFACTURING has delivered and placed into service two custom-built apparatus at Singapore's Changi Airport, which is managed by Changi Airport Group (CAG). The vehicles include a Pierce mobile command centre and a Pierce 26-metre aerial platform.

The Pierce mobile command centre is an integral part of the airport's emergency response plan. It can be rapidly deployed to mitigate risks in the event of an incident. The vehicle features interoperable communications equipment and live video streaming to provide vitally important information to the airport's Crisis Management Centre. Emergency response teams can more readily and efficiently manage, organize, and monitor incidents

for long periods of time from the command centre's conference area.

The Pierce aerial ladder platform is built on a custom chassis with a 26-metre aerial device. The platform's spacious basket, with a carrying capacity of 454kg, is engineered for strength and performance. Pierce aerial platforms feature Command Zone advanced electronics that deliver critical platform performance data in real time, giving the operator the information needed to work within the platform's safety parameters.

These two custom Pierce vehicles join five new generation Oshkosh Striker aircraft rescue and fire Fighting (ARFF) vehicles that were recently delivered to Changi Airport.

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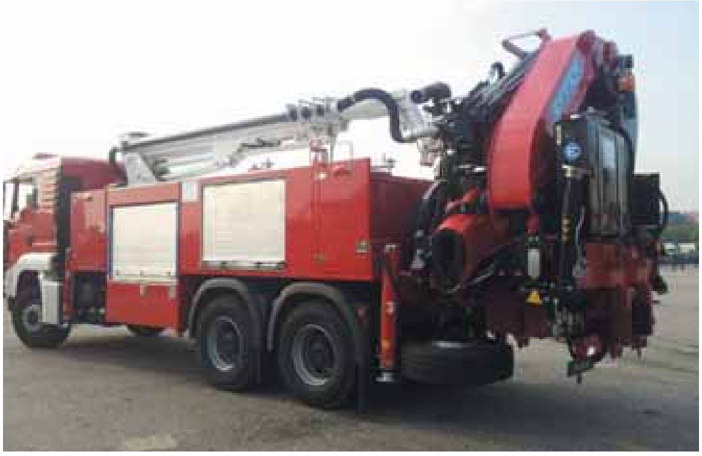
Aerial platform in Hong Kong

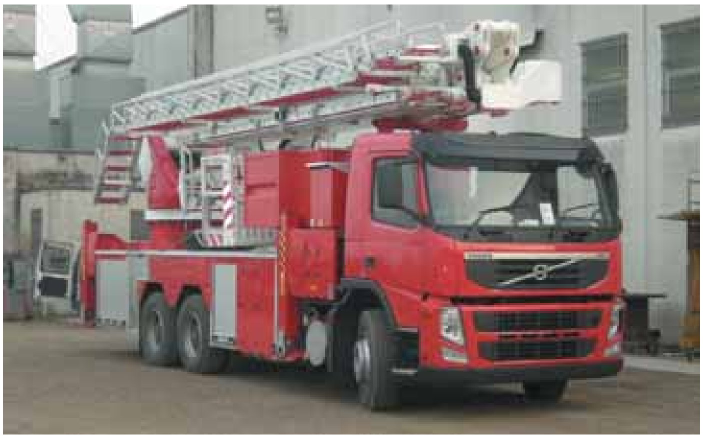


CTE delivered a special B-Fire aerial platform to Hong Kong equipped with a water tower arm and an Effer crane for lifting hydraulic tools. This special B-Tower is mounted on MAN truck to produce the multi-purpose vehicle required by the customer.

The CTE B-Fire platform and water tower B-Tower have a range that goes from 22 metres working height up to 62 metres, and are available with a wide range of options to suit the most demanding working conditions.

For more information, go to www.ctelift.com

Thailand's Aerial Platform



CTE SpA has delivered a B-Fire 360 aerial firefighting platform with a working height of 36 metres and a 450kg basket capacity to the Lampang City Municipality, the capital city of Lampang Province some 640km north of Bangkok, Thailand

The B-Fire platform is available with or without the side ladder and comes with a wide range of options. It has a telescopic jib and the basket allows access for four firefighters with full equipment. The platform also includes a side staircase made of aluminium alloy, an integrated electronic system, three command posts and an automatic stabilisation system.

For more information, go to www.ctelift.com

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6,6 Kw (440 /480 V – 60 Hz)
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WIDTH 58 cm,
23", LENGTH 97 cm / 38.5"
DRY WEIGHT: 119 Kg / 262 lbs

MCH 16/DY ERGO
DRIVEN BY: DIESEL YANMAR L 100
CHARGING RATE: 265 L/pm 16 m^3/h 9 CFM
POWER: 6,6 Kw
DIMENSIONS: HEIGHT 69 cm / 27",
WIDTH 56 cm / 22", LENGTH 113 cm / 44.5"
DRY WEIGHT: 125 Kg / 275 lbs

MCH-6/SH
DRIVEN BY: HONDA PETROL ENGINE
CHARGING RATE:
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POWER: 3,5 Kw / 5.5 Hp
DIMENSIONS: HEIGHT 35 cm / 13.7"
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LENGTH 78 cm / 30.7"
DRY WEIGHT: 38,5 Kg / 85 lbs

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Graham Collins

Kitted Out

The technology behind the latest helmets, gloves and boots continues unabated, as manufacturers strive to develop the ultimate personal protection for fire and rescue professionals. Here we look at the latest products to come from the major manufacturers.

Today's Hero

With the advent of the HAIX Fire Flash, the Bavarian company introduced what it describes as "ground-breaking innovations to improve safety, protection and wearing comfort", with the Haix climate system providing optimal moisture regulation in the shoe and the micro-soft-light system not only providing cold insulation but heat insulation as well. The foam rubber, highly wear-resistant and non-marking shell sole offers high dampening properties that are perfect for any terrain. The integrated Gore-Tex technology keeps the Haix Fire Flash watertight, breathable and keeps chemicals out.

The Fire Hero is the company's top model: a firefighter boot said by Haix to have "never seen before in such functional perfection". The latest product in this series is the Fire Hero Vario, a slip-on version. Light, secure and comfortable, that although not equipped with complex fastening technology, the Haix ankle flex system enables the best possible fit for a slip-on boot. Stretch inserts also make it easier to put the boot on. Integrated bending zones in the instep and above the heel ensure high flexibility during forward and backward movement, such as when in the kneeling position. The CrossTech membrane keeps both bacteria and viruses out while still remaining breathable.

The brand-new, sporty recreational product line Black Eagle from Haix combines running shoe technology with functionality. This sporty professional comes in two product lines. The Athletic is characterised by a light, microfiber design, while the Tactical series is designed using classic leather. Both are available in three different heights and with equipment options that professionals want in a shoe – both on the job and off.

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MED-approved Protection

The most recent products from Croatian helmet manufacturer, PAB AKRAPOVIC, is the PAB Fire 04 HT, the PAB Fire 03, the PAB Compacta and the PAB Compact III FF, all of which are made of fireproof composite fibre reinforced materials and co-polymer plastics.

The new Fire 04 Composite is being heralded by the company as the fireman`s helmet of the future, incorporating new technology and superior design, guaranteeing complete safety even in flashover flames. It provides protection against temperatures of up to 1000°C in a ten-second flashover flame, weighs just 1.35kg (including visor face shield and neck protector), and is available with a wide range of accessories. Neck protection is aluminised carbon-fibre, while Interior shock absorption is made of polyurethane foam.

The PAB Compacta helmet provides a high level of protection; it is light and comfortable and also comes with a number of accessories that allow the helmet to be personalised.

Both the PAB Fire 04 HT and the PAB Compacta are designed for marine firefighting in accordance with the latest EC Marine Equipment Directive (MED).

For more information, go to www.pab-buzet.com

Extra Protection

"Be on the safe side with blood and body fluids", that is the message from ESKA when promoting its SKA 100 Crosstech glove with X-TRAFIT product technology for technical rescue operations, when firefighters face countless threats. In these applications, protective gloves must contend with these threats and offer a high degree of tactility.

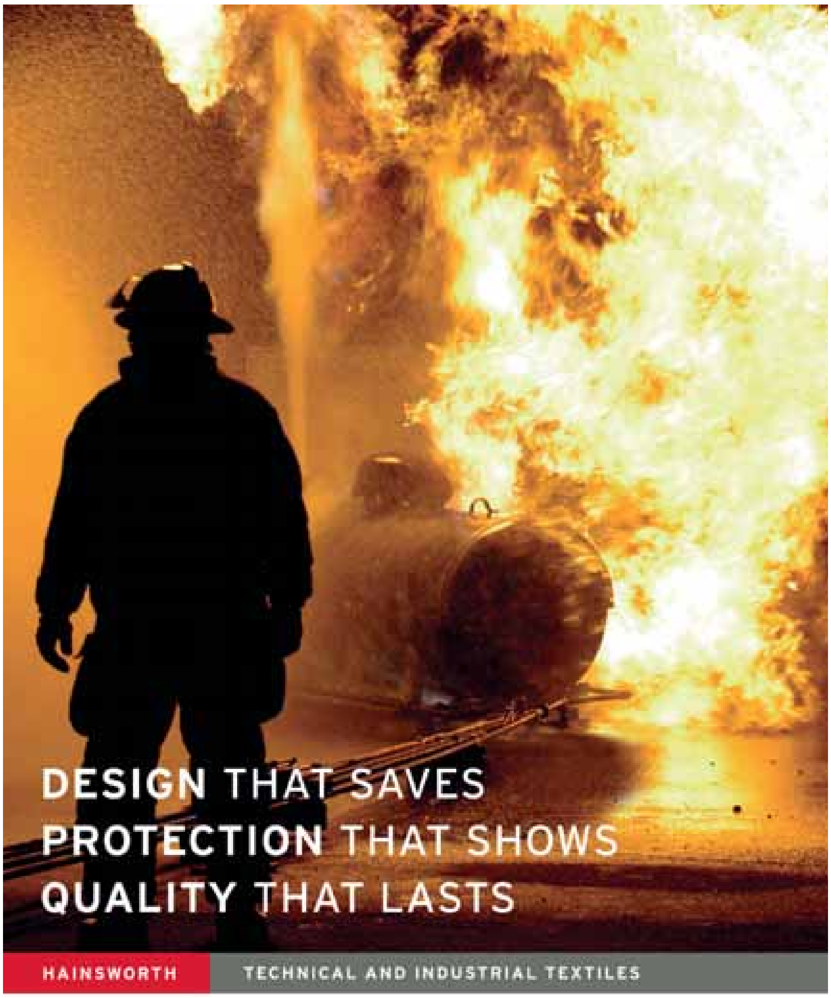
Making the right decision is not as simple as it might seem. At the moment there are no EU-wide standards requirements for protective gloves for technical rescue operations. Risk assessment is often influenced by specific incidents and driven by regional decision making even though, for example, the UK Fire & Rescue services assess that the risk from exposure to blood and body fluids is higher than from heat and flame.

The ESKA 100 Crosstech glove offers both durable protection and comfort. It is penetration resistant to blood and body fluids to ISO 16604:2004 (*Clothing for protection against contact with blood and body fluids — Determination of resistance of protective clothing materials to penetration by blood-borne pathogens — Test method using Phi-X 174 bacteriophage*). The glove is also resistant to penetration by defined liquid chemicals to ISO 13994:2005 (*Clothing for protection against liquid chemicals — Determination of the resistance of protective clothing materials to penetration by liquids under pressure*) and NFPA 1951 (*Standard on Protective Ensembles for Technical Rescue Incidents*).

The glove is waterproof even after contamination or washing and breathable, meaning that moisture vapour can escape from the glove. Its construction incorporates an exceptionally thin and durable single-layer insert with soft, supple and barely noticeable sealed seams, while the Crosstech membrane insert is fully bonded to the inner lining and durably connected to the glove's outer shell. The glove inserts (membrane and seams) are tested according to ISO 1660, and the laminates and seams are resistant to the penetration by blood-borne pathogens.

This results in a glove with a high degree of tactility and a firm grip and flexibility; one that is easy to put on and take off. Tested and certified according to EN 388: 2003 (*Gloves Giving Protection from Mechanical Risks*), the ESKA 100 Crosstech achieved Level 5 for palm and back of hand cut protection; and Level 4 for thermal performance to EN 407: 2004 (*Gloves Giving Protection from Thermal Hazards*). The glove has also been tested and certified in accordance with EN 407: 2004 for resistance to contact heat and splashes of molten metal.

For more information, go to www.eska.at



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Standard Compliance

PACIFIC HELMETS will be both updating existing models and launching new models to the new edition of AS/NZS4067 2012 that is coming into effect later this year and will see increased minimum requirements for structural fire helmets in the South Pacific and East Asia.

The New Zealand company claims to be the only helmet maker that makes structural fire helmets certified to all three major international standards – AS/NZS, EN and NFPA – so asserts that these changes present no difficulties for it to meet, saying that the helmets Pacific currently makes fall well inside the requirements of any standard and so welcomes the changes that bring increased safety to the wearers.

The latest model to be released that will be certified to AS/NZS 4067: 2012 is the F10 "Battler". This is a jet-style helmet that features Pacific's "one touch' automatic deploying eye protector. Also available in this model is the option of an ultra-high temperature resistant face shield. A version of this face shield will also be available for Pacific's popular F3D and F4C models.

For more information, go to www.pacifichelmets.com

Designed-in Flexibility

The latest in fire helmet design and technology from BULLARD is the Magma. Designed with input from firefighters from around the world, it offers the individual firefighter the flexibility to configure a helmet to his or her exact requirements. It is available in two lightweight – it weighs less than 1,400 grams – shell configurations, allowing firefighters the design flexibility to choose a half-shell or three-quarter shell helmet.

Magma's design flexibility does not translate into complexity. Bullard says that the helmet was designed with the fewest number of components of any helmet available today, featuring just 29 components that can be easily assembled in just a few minutes. The design meets the requirements of EN443:2008, providing firefighters with added confidence in the helmet's performance, protected firefighters from the heat, flames, sparks and fluids that are part of their daily firefighting activities.

Magma offers firefighters a high degree of wearing comfort. The padded head ring is anchored in the rear by the Bullard ratchet sizing mechanism that provides the wearer with the ability to make comfort adjustments at five different points. An X-shaped neck strap and a four-way adjustable chinstrap add further to the firefighter's ability to obtain a comfortable fit. The mask adapter design accommodates all of the leading brands of two-point respirator masks and is also spacious enough to accommodate spider-style mask harnesses.

Magma also features a three-dimensional visor that covers the retracted front frame for a maximum degree of visibility in all directions; it also accommodates a variety of communications and lighting accessories.

For more information, go to www.bullard.com

Safer Extrication

RINGERS GLOVES' new Extrication Hybrid Model 337 glove is being heralded as offering increased dexterity, improved grip and non-restrictive cuff. It uses what the company asserts are premium materials that are combined with the finest construction techniques to provide maximum hand safety.

The new glove incorporates Ringers' ResQLoc grip system; a dual-layer palm constructed with a Kevlar top layer and a Clarino leather bottom layer for superior grip, with sturdy Kevlar stitching throughout the entire palm. For extra impact protection, TPR bumpers are sonically welded and stitched on the top of the outer shell of the fingers and knuckles; there is also a high-visibility dorsal area. Ringers' Supercuff technology provides non-binding, non-restrictive cuffs for quick entry and a full range of motion. This new glove is oil resistant, boasts a CE rating of 4343 and offers the bonus of being machine washable and air drying.

For more information, go to www.ringersgloves.com

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Ho Chi Minh City's Crescent Mall

No structure best depicts affluence and wealth than a high-end, luxury retail complex. The Crescent Mall in Vietnam is the latest addition to a development set to have a huge impact on the infrastructure of Ho Chi Minh City.

Bill Benbow

Cooper Safety

It is true to say that customers at Vietnam's biggest shopping centre are going to be treated to five-star fire protection as well as a lavish, luxury shopping experience. The new five-story Crescent Mall, which forms part of a multi-complex development at the heart of a new and modern city, has officially opened, complete with the latest in fire and safety control.

Located beside Lake Crescent, within Phu My Hung in District 7, the $200 million Crescent development offers 45,000 square meters of prime retail space, 300 premium-serviced apartments, 10,000 square meters of international standard office space and 22,000 square meters of waterfront retail space. This multi-use development is fast becoming the heart of Phu My Hung's new city centre.

Phu My Hung Corporation, one of Vietnam's leading developers, started development of the 409 hectare Phu My Hung New City Centre over 20 years ago as a vision for a thriving modern city. The execution of the Saigon South master plan – the first multi-complex development in Ho Chi Minh City – has made this district become one of the most desired living destinations in Ho Chi Minh City; it is currently home to over 10,000 households.

Growing Economy

As Ho Chi Minh City changes and decentralises, District 1, the city's traditional shopping area is losing its status as the location for shopping malls in the southern region. Developments like the Crescent look certain to become more commonplace as the country's wealth grows.

Retail sales in Vietnam have steadily grown over recent years and as GDP continues to increase, retail outlets are evolving to meet the demand of a population with a growing amount of wealth. A recent report from HSBC predicts that Vietnam will

become one of the top 50 economies in the world over the course of the next few decades, predicting that the size of the economy will expand to $451 billion by 2050.

Building Regulations

One of the most important industries in Vietnam is construction, particularly as urbanisation is fast expanding in areas like Ho Chi Minh City and Hanoi. With that in mind, the construction industry and, in particular, safety legislation has dramatically improved.

While equipment and materials being used by the construction industry are in the most part set to international standards, Vietnam's building regulations are a harmonization of a number of different international codes. The influence of the United States is still strong, as the dominant building code is the American National Fire Protection Association (NFPA), but there is also an influence from Singapore building codes and Australia's AS codes.

Shopping Centre Fire Safety Challenges

Shopping centres, like any retail centre, face substantial public liability for a whole host of risks, from accidents and trips to the risk of fire. Fire in particular is no stranger to shopping malls worldwide and in 2002 Ho Chi Minh City played host to one of its most deadly peacetime disasters, the International Trade Centre fire.

The award winning International Trade Centre is an upscale mall with over 400 shops and restaurants and was, at the time, the sole-outpost for high-end designer stores in Vietnam. It was set ablaze following stray sparks from a welder's torch as work was carried out in the upper level nightclub, inside the building. There were an estimated 1500 people shopping in the mall at the time of the fire, which claimed 60 lives, while 120 people suffered injury.

This incident highlights the need for adequate fire and safety control and the benefits of these controls should not be in any doubt in large, complex, multi-occupancy buildings such as a shopping mall. It should also be clear that fire safety and smoke control systems should not just be restricted to maintaining smoke-free staircases and lobbies. With modern building designs, voice alarm systems, emergency lighting and smoke control systems all have a vital role to play in the total fire protection model.

From a fire protection perspective, shopping malls are generally the most complicated of retail structures, requiring a fire alarm system sufficiently intricate to provide communication between active systems such as, zoned sprinklers, smoke control provision, secondary power supplies, emergency lighting and manned control centres.

The Crescent Mall, like any other retail outlet of its size poses a number of challenges all of which need to be considered in the design process; from egress systems, to the complexity of the fire detection system to ensure the maximum safety of customers and occupants and to maintain the integrity of the building where possible. The systems at the Crescent Mall will protect the thousands of customers that are expected to walk through the mall's doors each day.

Fire Safety at the Crescent Mall

The Crescent Mall is typical of a modern shopping centre and involves the installation of a number of systems, many of which operate in conjunction with each other in the event of a fire- related emergency.

The fire detection and notification systems in the Crescent Mall have been designed to the Singaporean standard CP10. This standard originates from the widely accepted UK fire standard, BS5839. The design utilises a networked series of intelligent addressable panels together with a combination of intelligent addressable smoke and heat sensors, call points and interfaces that integrate a range of building services, such as the air conditioning, fire dampers and sprinkler systems into a cohesive fire detection and fire protection system. The design was carried out by SPCC, the in-house design operation for the Phu My Hung developer.

In general the mall area is protected by intelligent addressable point-type optical smoke sensors, with dual heat/smoke sensors in electrical rooms and heat sensors in the basement car park areas. The mall is also fitted with break-glass call points and visual notification strobes. The detection system is interfaced with a voice alarm system so that, in the event of a fire in any one zone, the system broadcasts a message to that zone plus the adjacent zones. The adjacent zones may well be a different fire compartment either on the same level or levels above and below. The system extends into the tenant shop areas and the system is altered to accommodate the tenants' fit-out design.

The system comprises eight 4-loop rack mounted controllers, internally networked. The entire system operates in Vietnamese. This allows local security staff to operate the system in the comfort of their natural language. The system monitors the sprinkler flow switches and status of the fire pumps. In addition, controls the fire dampers, air conditioning and gas supply across the global cause and effect matrix.

Life Safety Systems

In shopping centres and retail outlets, building regulations stress the importance of the provision of life safety systems. The Crescent Mall has a design occupancy of 15,000 people and this can represent a high risk when considering the number of people distributed throughout the building at any one time.

Evacuation time for shopping centres can be lengthy. Much depends on the efficiency of the staff to manage the evacuation process and a life safety system that includes a number of elements; fire-detection systems, including manual call-points, electronic smoke and heat sensors that activate audible alarms and that can be programmed to automatically notify local fire departments. For fire suppression, hand-operated fire extinguishers and sprinkler systems should be part of the overall system. Smoke is as dangerous as fire, so a well-designed smoke control system should be provided to maintain smoke-free escape conditions to allow the building to be evacuated with minimum risk of smoke inhalation. Protective measures include the automatic shutdown of ventilating systems and elevators and the division of the building into areas that are free from smoke. Occupants evacuate through smoke control protected exits.

The need to evacuate only the area of the mall affected by fire has resulted in an intricate system to ensure that fire can be detected in the early stages, the right areas are evacuated and the right systems are in the right part of the building. For example, smoke curtains and smoke extract operate to maintain the 'open' mall area as a place of comparative safety.

The "cause and effect" plan was agreed during the design process, and is developed from an agreed life safety system. This plan was agreed with local building control, and is designed to be robust throughout the life of the mall. Any deviation from, or change to, the plan should not be made without proper consideration being given to the affect that any such deviation or change would make to life safety.

For fire suppression, hand-operated fire extinguishers and sprinkler systems should be part of the overall system. Smoke is as dangerous as fire, so a well-designed smoke control system should be provided to maintain smoke-free escape conditions to allow the building to be evacuated with minimum risk of smoke inhalation.

Building to international standards is becoming easier in developing countries, aided by the growing infrastructure and a better understanding of building codes. Systems are being developed and produced in local languages, which aids the security of customers and staff managing the building.

A large development like the Crescent Mall poses a variety of risks and challenges. Guidance from the international fire community and experienced suppliers ensures the safety and longevity of the building and those who use it. While international manufacturers supply into emerging markets such as Vietnam, the challenges to complete projects, such as the Crescent Mall, are substantial.

Training of the contractors is key and appointing a local distributor is essential to ensure language and cultural differences do not inhibit the completion of an important part of the building services. For example, MP Co., the local distributor for the Crescent Mall, employs engineers certified by Cooper who then project manage the installation and commissioning of the system. As emerging markets develop, and local skill levels lag that of developed countries, an active involvement from concept design to final commissioning with local contractors and designers ensures this development meets the international standards and offers the protection expected in such a major development. **APF**

Bill Benbow is Asia Director for Cooper Safety

For further information, go to www.cooper-safety.com

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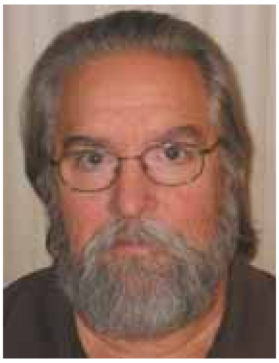

Climate Change and the HFC-Based Clean Extinguishing Agents

Mark L. Robin

DuPont Chemicals & Fluoroproducts

No other issue related to the hydrofluorocarbon (HFC) clean fire extinguishing agents is perhaps more misunderstood than the issue of their environmental impact.

This confusion in the clean agent marketplace results from a lack of understanding of three key issues. Each requires reviewing in detail and provides factual information related to the use and environmental impact of HFCs in fire suppression applications. The three issues are:

1 The meaning of global warming potential (GWP) values.

2 The impact of HFCs used in fire suppression on climate change.

3 Regulations related to HFCs in fire suppression applications.

Background

Since their introduction in the early 1990s, the HFC-based clean agents have been the most widely employed replacements for Halon 1301 worldwide, and there are currently hundreds of thousands of HFC-based fire suppression systems installed worldwide, protecting billions of dollar's worth of valuable and sensitive assets. The HFC-based clean agents employed in total flooding applications are FM-200 (CF_3CHFCF_3, HFC-227ea), FE-25 (CF_3CF_2H, HFC-125), and FE-13 (CF_3H, HFC-23).

Table 1 (below) shows a small sample of some of the facilities and equipment protected by HFCs. Major corporations employing HFC-based fire protection include Cisco, Westinghouse, Etisalat, Sprint, Lockheed Martin, Exxon/Mobil, AT&T, GTE, Nokia, Saudi Aramco, Intel, IBM, Mitsubishi and Wal-Mart.

The success of HFCs in the clean agent market is due to the fact that the HFCs offer the best overall combination of the properties desired in a Halon 1301 replacement, along with being the most cost effective replacements. All HFCs are characterised by zero ozone depletion potentials (ODPs), and hence they do not contribute to ozone depletion. As can be seen below, the impact of HFCs employed in fire suppression applications on climate change (global warming) is minuscule, rendering the HFCs a viable, sustainable replacement for Halon 1301 in total flooding fire suppression applications.

Table 1. Examples of HFC Clean Agent System Installations

Facility
National Museum of Pre-History, Taiwan
Eiffel Tower, France
Royal Thai Family Silk Museum, Thailand
Bangkok International Airport, Thailand
Smithsonian Institute, USA
US EPA Supercomputing Center, USA
Alexandria Library, Egypt
Dubai International Airport, UAE
Dubai Metro, UAE
King Saudi University, Saudi Arabia
Bouabieh Palace, Riyadh, Saudi Arabia
Aristoteles Museum, Greece
Dusseldorf International Airport, Germany

What are GWP Values, and What Do They Mean?

A clear explanation of what GWP values are can be found in Section A.1.6 of the recently published (2012) edition of NFPA 2001 Standard on Clean Agent Fire Extinguishing Systems, which demonstrates the fact that the GWP value considered by itself does not provide an indication of the impact of an agent on climate change, stating: "It is important to understand that the impact of a gas on climate change is a function of both the GWP of the gas and the amount of gas emitted. For example, carbon dioxide (CO_2) has one of the lowest GWP values of all greenhouse gas emissions (GWP=1), yet emissions of CO_2 account for approximately 85% of the impact of all greenhouse gas (GHG) emissions."

The GWP value for a gas simply compares the impact on climate change of the emission of the gas to that of CO_2. For example, a GWP value of 100 indicates that the emission of 1 kg of the gas in question has the same impact on climate change as the emission of 100 kg of CO_2.

Impact of HFCs in Fire Suppression Applications

The relative contribution or impact of any GHG to climate change is readily found from an examination of the number of the "CO_2 equivalents" associated with the amount of gas emitted. CO_2 equivalents are calculated by multiplying the mass of agent emitted by its GWP value, and are typically expressed in terms of "Tg of CO_2 equivalents," which can be calculated by multiplying the mass of emissions (in Tg) by the GWP of the gas in question.

Factual information related to the impact on climate change of HFCs in fire suppression applications is available from several independent sources. The US EPA (Environmental Protection Agency) has employed its vintaging model to estimate the emissions of greenhouse gases from various sources, and the most recent results are shown in Table Two and Table Three, which indicate the relative impact of GHG emissions (Tg of CO_2 equivalents) for the various GHGs and for HFCs as a function of industry, respectively.

Table 2. Relative Impact of GHG Emissions on Climate Change

Gas	USA	
	Tg CO_2 equivalents	% of Total
CO_2	5505.2	83.0
CH_4	686.3	10.3
N_2O	295.6	4.5
HFC	125.7	1.9
PFC	5.6	0.1
SF_6	14.8	0.2
Total	**6633.2**	**100%**

Source: US EPA 430-R-11-005 (2011)

As can be seen from Tables Two and Three, the impact (in Tg of CO_2 equivalents) of HFC emissions from fire suppression applications represents 100 x (0.8/6633.2) = 0.012% of the total impact of all GHGs. That is, the impact of HFC emissions from fire protection applications represents approximately 0.01% of the impact of all GHG emissions.

Table 3. Relative Impact of HFC Emissions on Climate Change

Gas	USA	
	Tg CO_2 equivalents	% of Total
Refrigeration	104.9	83.5
Aerosols	9.1	7.2
Fire Protection	0.8	0.6
Foam	3.9	3.1
R-22 Manufacture	5.4	4.3
Solvents	1.3	1.0
Semiconductor Manufacture	0.3	0.2
Total HFC	**125.7**	**100%**

Source: US EPA 430-R-11-005 (2011)

Recent results from the HFC Emissions Estimating Program (HEEP), which estimates the emissions of HFCs from fire suppression, are in agreement with the results of EPA's vintaging model results for the emission of HFCs from fire suppression applications. The HEEP analysis also indicates that the emissions of HFCs from fire suppression applications have been steadily decreasing since 2007. The clean agent industry has done an excellent job of policing itself and reducing unnecessary discharges through its adherence to the Voluntary Code of Practice (VCOP) for the Reduction of Emissions of HFC & PFC Fire Protection Agents, a partnership of the U.S. EPA, Fire Equipment Manufacturers Association (FEMA), Fire Suppression Systems Association (FSSA), Halon Alternatives Research Corporation (HARC) and National Association of Fire Equipment Distributors (NAFED).

Emissions data is also available for EU-15 countries, and are summarized in Table Four and Table Five [Annual European Union GHG Inventory 1990-2009 and Inventory Report 2011, 27th May 2011]. As is the case for US emissions, the EU-15 data indicates that the relative contribution of HFCs in fire suppression applications to climate change is minuscule; 100 x (2.6/3729) = 0.07% of the impact of all GHG emissions.

Table 4. Relative Impact of GHG Emissions on Climate Change

	EU-15	
Gas	Tg CO_2 equivalents	% of Total
CO_2	3063	81.5
CH_4	311	9.0
N_2O	280	7.7
HFC	66	1.6
PFC	2	0.1
SF_6	6	0.1
Total	**3729**	**100%**

Table 5. Relative Impact of HFC Emissions on Climate Change

Gas	EU-N15	
	Tg CO_2 equivalents	% of Total
Refrigeration	50.1	75.9
Aerosols	7.6	11.5
Fire Protection	2.6	3.9
Foam	5.7	8.6
R-22 Manufacture		
Solvents		
Semiconductor Manufacture		
Total HFC	**66.0**	**100%**

Regulation of HFCs in Fire Suppression Applications

The Montreal Protocol relates to ozone depleting substances (ODSs), and not to zero ODP agents such as the HFCs, hence, HFCs are not subject to the provisions of the Montreal Protocol. The Kyoto Protocol and F-Gas Regulations are related to the reduction of GHG emissions, but are solely concerned with emissions reductions and do not limit or prohibit the use of HFCs in fire suppression applications. Regulators understand the science as illustrated above; they understand the minuscule impact of HFC emissions associated with fire suppression.

With regard to the regulation of any chemical, no one can guarantee a lack of future regulations, and speculation on this point serves only to confuse the industry and drive end users to non-clean alternatives such as sprinklers. No one can guarantee that HFCs in fire suppression applications will never be phased out – not without being able to divine the future.

Can anyone guarantee that perfluoroketones will not be phased out in the future? Unlike other clean agents, perfluoroketones are characterised by high chemical reactivity (for example, hydrolysis when crossing the lung-air interface, cf. Novec 1230 Fire Protection Fluid Safety Assessment, 3M). Even the inert gases have been challenged by acoustic damage, high cylinder pressures, and room over-pressurization. Regulations continuously evolve as new science, information, and issues develop in the marketplace, and no product is immune to a changing regulatory future.

It is a fact, however, that with regard to regulations, HFCs in fire suppression applications are being treated differently than HFCs employed in other applications. Emissions of HFCs from fire suppression applications are dwarfed by HFC emissions from other applications such as refrigeration. Regulatory bodies understand this, and to date HFCs in fire suppression applications have been subject to different sets of regulations. A good example is the F-Gas regulation in Europe, which has adopted, supported and regulated good industry practices around system filling, handling, and servicing of fire systems.

It is important when encountered with an assertion of impending legislative or regulatory action related to HFCs in fire suppression applications to always request two items:

1 A copy of the legislation
2 The location of the text that is specifically related to HFCs in fire suppression applications.

This will avoid confusing specific targeted information with broader market relevance, or extrapolating an action in one target sector to another entirely different sector, such as fire suppression. The two following examples from a recent article (Asia Pacific Fire Magazine, October 25, 2011) exemplify these risks.

In the article it stated that: "It has been reported in the National Academy of Sciences that if nothing changes, HFC emissions are likely to be equivalent to between 9 to 19 percent of global greenhouse gas emissions by 2050." This statement refers to the report, "The Large Contribution of Projected HFC Emissions to Future Climate Forcing," Velders, et. al., Proc. Nat. Acad. Sciences, (106), 27, page 10949. The article specifically relates to HFCs used in refrigeration, air conditioning and insulating foam production where emissions dwarf those of HFCs from fire suppression applications. The report further indicates that HFC-227ea was not even included in the analysis due to its small use and emissions. The article supports the case for the use of alternative technologies and emission reduction schemes for highly emissive HFC uses, but offers no analysis or comment on the use of HFCs with respect to fire suppression.

The same article also refers to a petition to the US EPA to delist acceptable SNAP substitutes: "In May 2010, the US EPA received a petition to selectively remove HFCs from the list of acceptable substitutes under the EPA's Significant New Alternatives Policy Program (SNAP). This move could have a large impact on the fire protection sector…" The US EPA received the petition from the National Resources Defence Council (NRDC) in May of 2010. The petition is a request to remove a single HFC, HFC-134a, from the list of acceptable substitutes for CFC-12 in motor vehicle air conditioning systems maintained under EPA's Significant New Alternatives Policy (SNAP) program, and to remove HFC-134a from such list in any other end-use category (for example, aerosols and stationary refrigeration) where more benign alternatives are available. Specifically, this was not a petition to "selectively remove HFCs" from the SNAP list, but a petition to remove one, highly emissive compound from specific refrigeration applications, for which the user industry was already moving to adopt a viable alternative. Before addressing the original petition, the EPA required the petition to limit the scope to new mobile air conditioning applications in new passenger cars and light duty vehicles only, and is now just beginning a process to determine whether such a transition can occur. Stakeholder input is currently being assessed, and there has, to date, been no decision as to whether or not such a transition will occur in this specific market sector and application. As such it is puzzling to see it asserted that this petition could in some fashion affect the clean agent fire suppression industry.

Conclusion

Factual information related to the impact on climate change of HFCs in fire suppression applications is available from several sources, and this data demonstrates that the impact of HFC clean agents on climate change is minuscule. As a result, HFCs are expected to remain viable, sustainable, and environmentally acceptable replacements for Halon 1301 well into the foreseeable future. APF

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Radiological survey team in line

The "m" in mSv Stands for Micro – Right?

Steven Pike

Argon Electronics (UK)

The Fukushima Nuclear reactor problems as a result of the Japanese earthquake and subsequent tsunami demonstrated only too well that just when you think matters cannot get worse – they most likely will, and even when 20 kilometres away, that does not mean your locality will not be affected. Unsurprisingly the incident has resulted in an increase in interest in nuclear emergency response exercises.

On a lovely warm sunny day in the southern USA the exercise coordinators prepare for the day's nuclear exercise. Argon had been asked to assist with the provision of simulation equipment for the duration, as the exercise controllers were keen to see if they could enhance the overall quality for the exercise and in particular improve upon the use of the traditional inject whereby the student is shown a piece of card or the modern version, and electronic notepad to represent pretend instrument readings.

The response team to be evaluated was assembled and then briefed about a problem at a fictitious nuclear power station that was 20 kilometres away and just happened to be upwind of the team's present location. The team then had to decide what action was required and what equipment was necessary in order to assess the potential risk posed to the local population.

Once the potential risk had been determined, they were to brief the local authority and make recommendations regarding the protection of those who may, or may not be at risk. Sounds fairly straightforward, doesn't it?

The exercise simulation requirement was discussed, which was as follows:

- A single plume to reach the training area 40 minutes after initiation of the exercise with deposition across the training area.
- The plume to comprise the following radionuclide's:
  - 137C.
  - 131I.
  - 90SR.

Radiological survey monitoring

- The following simulation instruments were required:
    - Survey simulator.
    - EPD-Mk2 Dosimeter simulator.
    - SAM 940 spectrometer simulator.
    - Alpha simulation for RADECO air sample filter contamination simulation.

The simulation control system comprised a laptop with the Argon Rad PlumeSIM software and live field base station, which provided effective real time exercise control throughout the exercise area.

A local map to assist in planning the simulated exercise and also to aid tracking the students was obtained using one of the many freely-available map resources to produce a .jpg image of the local terrain, which was then calibrated using a feature included within PlumeSIM.

Each survey team was to be equipped with a survey meter, personal dosimeters, and a spectrometer, with the remainder of the students responsible for communications (hand-held portable radios were provided for this purpose), logistics and the collation and management of the data received from the survey team, as well as the generation of the hazard prediction plots.

The exercise commenced with the team being briefed about the problem at the local nuclear power station. At this point they were advised that the extent of the problem at the power station was unknown, and that they would be provided with further information as the situation developed.

So, what do you think you would be doing having received such news?

a Consider deploying a means of monitoring in case the information provided was inaccurate or out of date (hence the plume was closer than anticipated)?

b Chat about last night's television sport?

c Call your mum?

It is fair to say initially the equipment remained where it was prior to the exercise brief. After a little prompting, a decision was made to deploy a Radeco air sampling station. While the assembly of the sampler proved to be relatively easy, there was more than one view as to what airflow setting should be used initially during the warm-up period, and also the importance of keeping the exhaust of the generator used to power the Radeco a reasonable distance from the air sample intake. There was also some debate between students as to what was the ideal airflow rate to be set after the initial warm up phase.

The exercise coordinator then announced that a radioactive release had been confirmed, and that the estimated time of arrival of the release to the current location was 40 minutes. At this point the simulated plume release was initiated, the system configured to provide plume cover at the desired time over the exercise area. A preliminary trial run had been carried out to ensure that the desired readings were obtained in the appropriate locations.

PlumeSIM has a very nice feature that enables you to fast forward or pause the exercise, thus enabling the exercise controller to manage the staging of the exercise to suit the precise progress and status of the exercise participants. While we all know that, in the real world, nature takes its course in its own time, an exercise may be to evaluate, test, validate or educate or a mixture and as such sometimes it can be useful to "pause the exercise" to perhaps provide some gentle guidance to ensure the students get the very best out of the day's experience.

A portable player device is worn by each survey team member. The exercise control system automatically transfers the exercise to the player unit, which then broadcasts the simulated radionuclide activity to the allocated simulators based upon the student's geographic location. The students' movements throughout the exercise are monitored in real time and recorded for after-action review later back in the classroom.

The team decided to check the Radeco filter to see if any reading could be obtained. A simulation source had been installed on the inside of the filter paper holder, and when the simulation Alpha probe was offered up to the filter paper a reading noticeable above background was obtained. The reading was reported to the control cell together with the flow rate and the duration of the sample period, thus enabling the airborne activity level to be determined.

A survey of the local area was requested. A survey team of four comprising two team members each carrying survey simulators, (both generic survey simulators) and one team member with a SAM940 spectrometer simulator, with the fourth team member being responsible for radio communications. Two of the team were also wearing simulation dosimeters based upon the EPD-Mk2.

The areas in which the survey team would receive simulated radiation readings and to what level had been pre-determined by the exercise controller such that initial readings would be obtained typically 150 meters away from the command station, the requirement being to simulate readings as a result of uneven deposition. The survey team spread with a distance of ten meters between each of the three instrument-carrying members, the communications operative following a little behind the line.

As the survey team approached the "hot zone" readings started to climb above background level and were called in. This is where, from an observer point of view, the exercise started to get interesting. Remember it was a very sunny day. The team members were suitably dressed in protective ensemble and wearing respirators, and this combined with the bright sunlight made the displays rather more difficult to read than when in the nice comfortable classroom and not wearing a respirator.

The team member carrying the instrument would call out a reading. The communications operative would then contact the control centre and repeat the reading, quickly followed by the originator calling out "no, that's not what I said" and repeat the reading again. The respirators were not fitted with voice modules and so inevitably verbal communication was not straightforward. That was between two humans. When the message is then relayed across a hand portable radio by the communications operative also wearing a respirator the whole event turned into something reminiscent of a child's game of Chinese whispers!

Another interesting observation was confusion over units of measurement. It so happened that some instruments we set to indicate in Rem, while others were set to indicate in Sv/hr. The simulation survey meter reading rose to 10mSv/hr and the call went out "now reading 10mS/v", each letter m, s and v being stated phonetically, (Mike, Sierra. Victor), which was duly acknowledged by the communications team member with the response "m – Mike stands for micro, right?"

The fact that some instruments were indicating different units of measurement also generated some interesting discussion regarding the relationship between Sv/hr, Rem etc. While it is fair to say that there would most likely be consistency within particular groups as to the units of measurement used, serious incidents such as in Japan often result in multinational involvement with the inevitable preference for different units of measurement among different well-meaning groups.

The message to take home here is clear – those expected to use instruments of any type must be well practiced in being able to read and correctly interpret the actual display. Furthermore, they need to absolutely understand the significance of any readings they observe, and ensure these readings are communicated to any third-party accurately.

The display on the SAM 940 simulator (in fact a simulation probe attached to a real SAM940 detector) started to flash red, advising of a dangerous radiation level being present. Upon selecting "identify" the spectra was displayed together with the radionuclide list, which was correctly read out and reported. While the survey team stood discussing the readings suddenly a beeping was heard – one of the dosimeters has exceeded the pre-set dose alarm.

Like most dosimeters, the EPD-Mk2 is rather small and therefore has a small display, and in particular the unit of measurement indicator is very small and care is required when reading the display if wearing a respirator or level A suit (although in some instances such devices are worn inside the level A suit). While the dosimeter alarm was being reported to the control station a second simulation dosimeter also started to alarm.

Radeco Set-up

The survey team completed its mission and returned to base for a full debrief. The group being evaluated then had to provide (and justify) their recommendations with regards to the evacuation or otherwise of the local population.

A number of visiting teams were to be put through the same exercise scenario, some of which comprised members who had not worked together before. This in itself highlighted some interesting problems, not least of which was differing levels of proficiency within the team, whereas if a team had trained and worked together previously, there was a stronger sense of organisation and competency.

Summary

The simulation system enabled a sophisticated scenario involving multiple radionuclides to be implemented with ease and repeated as and when required. Perhaps the greatest value was the ability to generate relatively high instrument readings such that most operators had never had to experience before. This in itself exposed the problems that can occur if these readings are not fully understood or incorrectly communicated.

The importance of training regularly as a team was evident, however as was noted when teams were made up from people who had not worked together before, there is great merit in replicating this situation in training, since you never know when you might be asked at a major incident to either join or command a team that until that point you had never worked with previously.

The exercise coordinators found it refreshing not to have to calculate the dose alarms and simulated dosimeter readings for the inject cards, as this was taken care of automatically by the simulation system. APF

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New Zealand's Fire Sprinkler Standard in Review

Vicki Allison

Standards New Zealand

The New Zealand Standard for automatic fire sprinklers is undergoing a limited technical review.

This does not involve a complete rewrite of the Standard but the expert committee conducting the review will focus on addressing only the specific issues within the scope of the project. The committee will shortly be seeking feedback on the proposed changes. One of the proposed changes to the Standard is that it includes guidance on how to provide sprinkler protection for non-sleeping buildings intended for community use such as Maori meeting houses, churches, community halls, and places of special interest.

NZS 4541:2007 (*Automatic fire sprinkler systems)* covers the design, installation, and maintenance of sprinkler systems so that systems reliably achieve their fire control functions – that the fire should be controlled within a specified area and that control should be achieved before levels of toxic by-products of combustion become life threatening. NZS 4541 is referenced in the Fire Safety and Evacuation of Buildings Regulations 2006 and in Acceptable Solution C/AS1 Protection from Fire and F7/AS1 Warning Systems of the Compliance Documents to the New Zealand Building Code, and is used extensively across the fire protection industry.

This is not a complete rewrite of the Standard, which covers the design, installation, and maintenance of sprinkler systems. Changes to the Standard were initiated by the New Zealand Fire Service (NZFS), which identified a need to protect certain types of buildings, and are aimed at providing sprinkler protection for non-sleeping buildings without the cost being prohibitive. It is intended for community use buildings such as Maori meeting houses, churches, community halls, and places of special interest.

Affordable Sprinklers for Community Buildings

The change was initiated by the New Zealand Fire Service (NZFS) which identified a need to protect the building types referred to. While the buildings are not required to have a sprinkler system, the cultural, historic, or community importance of them mean they might benefit from this additional protection. The NZFS funded BRANZ (an independent and impartial research, testing, consulting and information company providing resources for the building industry) – with additional funding from the Building Research Levy – to conduct research into ways to protect these types of buildings and the recommendations have been turned into an informative appendix in NZS 4541.

Ed Soja, Senior Fire Engineer at BRANZ, who conducted the research, and a member of the revision committee, says the aim of the new appendix is to provide protection without the significant costs associated with a "commercial" sprinkler system.

"There are already a number of owners of community buildings across New Zealand who want to install sprinklers in their buildings but because NZS 4541 covers commercial buildings, the costs have been prohibitive and the designs over-engineered for these types of buildings. By limiting the scope of protection, the committee has been able to develop a system that will provide necessary water to control the fire before the Fire Service turns up."

These variations include allowing smaller water tanks, electric pumps, and simpler valve sets. It is estimated that, depending on the size and location of the building, these compromises could result in substantial cost savings compared with a regular sprinkler system.

Other Changes to the Standard

As part of the limited technical revision, the committee is reviewing the provisions for towns' mains water supplies. The testing, maintenance, and inspection regimes will also be revised, to bring them up to date with current practices and ensure they are complete and correct.

The requirements and procedures for designing standard sprinkler system protection for extra high hazard class sprinkler systems has been completely replaced with design data taken from the draft Australian automatic fire sprinkler systems Standard. These changes can allow considerable cost savings and increased reliability in the protection of high-piled storage warehouses.

Following the Canterbury earthquakes in 2010 and 2011, the committee agreed it was timely to update the seismic design section of the Standard to incorporate any findings from this event. This primarily relates to the design of water storage tanks, and bracing requirements.

Feedback on the Draft Changes Sought

As with all New Zealand Standards, the revised and improved Standard is being developed by an expert committee using a consensus-based approach. The process is transparent and includes a public comment period. This process ensures that Standards solutions are practical and relevant in a New Zealand context, and that they will be widely recognised and supported.

The committee is aiming to release the draft Standard for public comment in late June. As this is a limited technical review, Standards New Zealand is providing a summary of the changes, which can be used as a quick reference guide to aid review of the draft. (Feedback not relating to the scope of the Standard will be accepted but may not be considered as part of this review.)

To receive a notification that the draft Standard is available to review, sign up to Standards New Zealand's 'keep me up to date' service at www.standards.co.nz:/services/kmutd.htm. **APF**

While the building types in question are not required to have a sprinkler system, their cultural, historic, or community importance means they might benefit from additional protection. By limiting the scope of protection, a system has been developed that will provide necessary water to control the fire before the fire service turns up.

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Mobile satellite broadband, wireless video and interoperable communications solutions are transforming the effectiveness of fire service incident command communications around the world.

Wildfires, wide-area and fast moving large-scale fires, road and tunnel fires, major sporting events, terrorist attacks and multi-agency emergencies all pose major challenges for fire and rescue services around the world.

One huge boost to fire services grappling with these challenges has been the introduction of mobile satellite broadband and wireless imagery into the range of communications options now being made available to commanders in mobile command vehicles and in control rooms. These solutions are capable of giving commanders at all levels of an incident, and commanders in supporting multi-agencies, a much clearer and faster real-time view of what is happening on the ground, as well as improving the means for deploying their forces more efficiently.

In recent years the new generation of emergency command vehicles developed by companies such as Excelerate Technology has helped deliver huge improvements in the way fire services are able to manage the wide variety of incidents they deal with.

New, improved communications across incident grounds and back to headquarters, using mobile satellite broadband, internet, voice and live wireless video, are delivering faster data flows, real-time situational awareness and a common operational picture – within services and between services – at levels never previously achieved. This is important, because it means services are now able to perform much more effectively, and some of the mistakes of the past, highlighted by major incidents where lives have been lost unnecessarily, are less likely to happen.

Supporting this pioneering collaborative work within the emergency services, these companies have helped drive the development of what are now considered to be some of the most advanced mobile emergency command vehicles in the world. This is generating strong interest from fire forces around the world. The expertise of companies like Excelerate Technology means that there is now the capability to support a huge variety of different requirements from emergency services.

With budgets tight, growing numbers of emergency services are now drawing on a wide variety of skills – specification, design, prototyping, development of bespoke solutions, integration, training, support and consultancy – to implement new installations and to retrofit communications solutions into existing vehicles.

'Best-of-breed' new technologies and integrated solutions are now being adopted by emergency services to support their plans and operations. Key among these technologies has been the use of mobile satellite broadband and wireless solutions to deliver data, voice, internet and video to commanders.

Critical to the success of these developments has been the need to identify how emergency service communications requirements can be best supported in practical, realistic ways. In some fire services, for example, such as the West Midlands Fire Service in the UK, reports compiled from post-incident debriefings have helped technical staff identify the key command communications requirements of operational commanders. These reports have been complemented by prototyping, testing, training and exercising to deliver maximum operational benefits for the investments made.

While there are variations in the different types of command suites and technologies used within the various emergency command vehicles, there is generally a core set of common systems, features and functionality. (Some of these solutions are unique to Excelerate, having been developed by the company's Research and Development department).

To help services identify which solutions are likely to be of most use to them, a straightforward user's guide to mobile emergency command solutions includes:

Mobile Satellite Broadband Communications

This transformational technology provides commanders with a robust, easily accessible and high capacity capability. Roof-mounted transportable satellite solutions provide resilient stand-alone broadband connections giving access to secure telephony, data, video, internet and email facilities. Satellite broadband is highly robust, a key factor during major emergencies when other communications systems can be overloaded.

Satellite communications enable command and control vehicles to receive and transmit data from all responders and emergency teams and achieve a common operational picture. Combined with wireless networks, personnel using PDAs, laptops mobile phone and data terminals can access tactical plans, live video streaming or information from strategic emergency planning software. The range can be extended using self-powered, rapidly deployable MESH wireless nodes.

Wired, Wireless and Rapidly Deployable Cameras for Live Video Viewing

Optical and dual-thermal cameras can be mounted on self-powered tripods, the Sherpa climbing camera platform, extendable, pneumatic masts and aerial platforms to transmit live video by COFDM (an advanced industry communications standard) into incident command units and control rooms for viewing by command staff operating at the scene of an incident, and streamed via secure servers to higher level command for online access in real-time by authorised personnel. Body-worn cameras can also be used to provide fast reaction video of incidents. In addition, Excelerate, for example, can install receivers to provide 'heli-tele' downlinks, allowing aerial images from helicopters and UAVs to be viewed in command vehicles.

Digital Dashboard Management Interface (DDMI)

The digital dashboard management interface is a highly innovative new solution that enhances system performance, reliability and communications interoperability.

The simple-to-use interface enables operators to monitor and control the systems and technologies on board command and control units effectively and efficiently, enabling them to focus primarily on their operational roles and to get the best out of their technology and training investment. The system also allows remote login for problem solving and support.

An Excelerate-developed product, the digital dashboard management interface solution has been designed by Excelerate Technology's R&D department specifically for the emergency services market. Modules within the DDMI include: the communications management suite (PBX), satellite controls, weather monitoring, power systems, and the screen and video source selector.

Independent GSM Networks

RapidNet is a private mobile network system that enables an independent GSM network to be generated at the scene of an incident if public GSM networks are overloaded or compromised during major incidents or because of other problems.

WiFi Nodes

To support the new trend for using wireless cameras and ruggedised laptops across incident grounds, portable, battery-operated WiFi extension nodes can be used to extend wireless MESH network capability across incident grounds. Such nodes can be in the form of rapidly deployable tripods (with hot-swappable batteries), body-worn nodes and vehicle-mounted nodes.

Sherpa Automatic Climbing Camera, Communications and ANPR Platform

Sherpa is the highly innovative new 'climbing camera' CCTV and communications platform system that automatically climbs up poles and places cameras and other emergency response communications devices in high temporary viewing positions, giving fire services vastly improved coverage of incidents and potential problems. Camera imagery can be controlled and viewed using iPads, iPhones or mobile and in-vehicle systems.

In a special package deal customers can now buy a complete 'turnkey' Sherpa solution (head unit, delivery unit, electronics unit, hand held controller and peli case) along with a tripod and a huge range of camera system options for attachment to the head unit (including dual thermal cameras). Because of its versatility Sherpa can be used in a wide variety of different roles. It can be deployed quickly by fire forces to monitor long running incidents, for example, or to provide high-level imagery without using aerial platforms. APF

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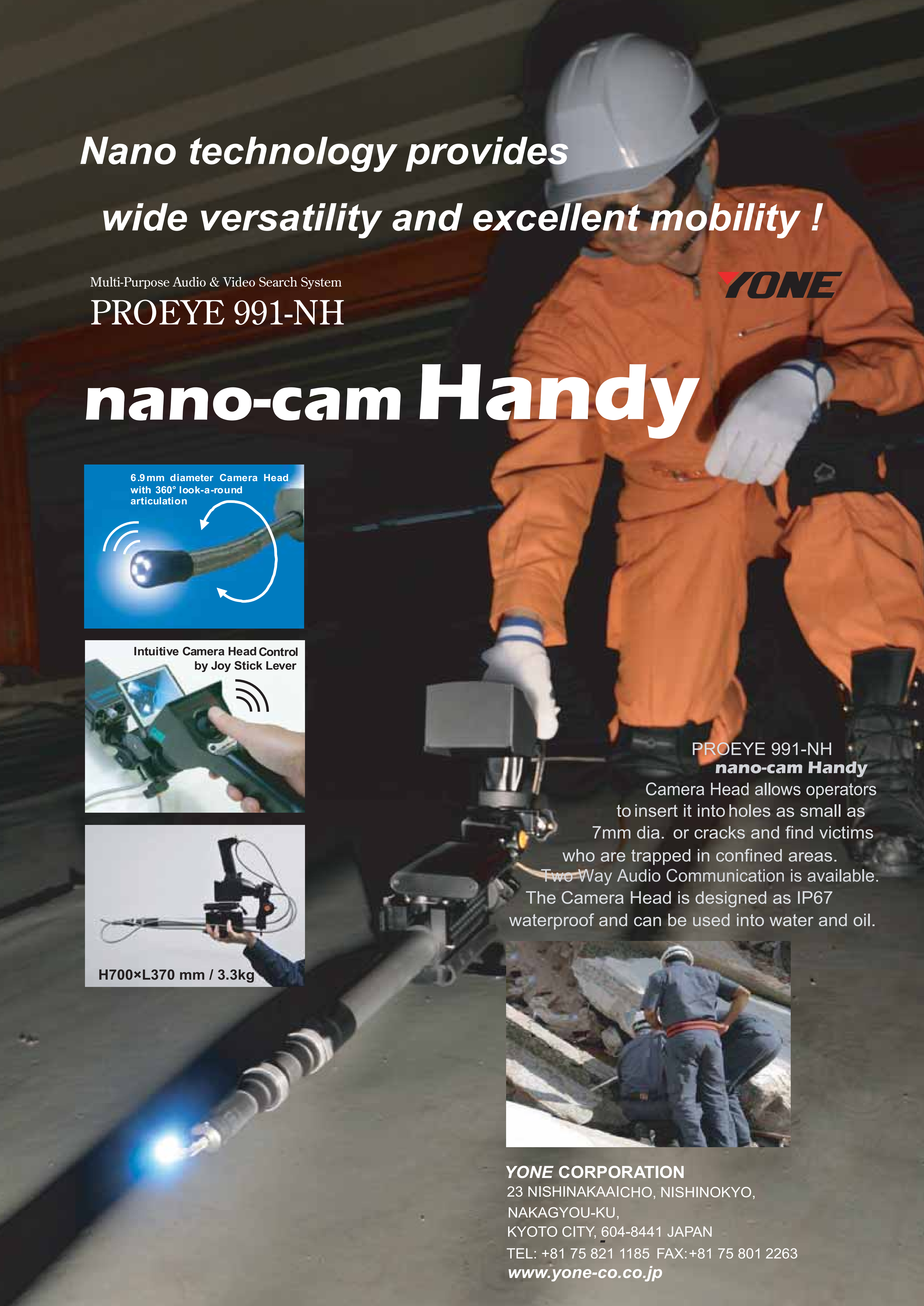
For further information, go to www.excelerate-group.com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Special Rescues De

Jessica King

Devon & Somerset Fire & Rescue Service

Water, rope, confined space, rescues from height and large animal rescue incidents all present unique challenges for fire and rescue services. Specific training in these specialised areas will ensure that firefighters are equipped with the knowledge and techniques required to work safely and effectively in what are hazardous and risk critical conditions.

The fire and rescue service is the only 'in land' emergency service that is able to respond to all types of specialist rescue incidents, therefore it is imperative that firefighters have the knowledge and skills to react to these potentially dangerous situations. With this in mind the Training Academy at Devon & Somerset Fire & Rescue Service (DSFRS) is dedicated to providing all internal staff with the highest standard of training and specialist rescue instruction. The Academy offers courses to other fire and rescue services and emergency service responders, commercial organisations and individuals in order to familiarise delegates with the hazards and risks that may occur in their industries and how they may improve safety within their workplace.

There have been a number of recent incidents in the UK that have highlighted the vital need for specialist rescue training within the fire service.

Safety at Height and Confined Space (SHACS) Including Rope Rescue

Recently an inquiry has been made into the 2008 Galston mine incident in Scotland, where a woman died, having fallen down a disused mine shaft. The inquiry states that: "This was an unusual and particularly dangerous incident and was beyond the experience of any member of the emergency services who attended". This case and others of a similar nature have highlighted the growing importance for fire and rescue services to undertake training in confined space, safety at height and rope rescue.

As well as the SHACS courses already on offer, the Training Academy has created a stand-alone confined space training programme in response to these incidents that will include Rescue & Recovery of Casualties for Fire & Rescue Services. It covers safe systems of work, competent and adequate supervision, understanding hazards and risks and capabilities.

Confined space incidents can make for the most dangerous forms of specialist rescue. Rescuing casualties from confined spaces presents a number of specified hazards and risks, including but not limited to:

- Risk of fire or explosion due to the presence of flammable substances.
- Risk of an increase in body temperature.
- Risk of gas, fumes, vapour of lack of oxygen leading to a loss of consciousness or asphyxiation.
- Risk of an increase in the level of a liquid leading to drowning.
- Risk from a free flowing solid directly causing asphyxiation or entrapment.

All of the stations within Devon & Somerset Fire & Rescue Service are trained in SHACS Level 1 safe working at height for firefighters and SHACS Level 2, which includes a rescue element for casualties in extreme circumstances. DSFRS specialist rescue stations are trained in SHACS Level 3, which includes any rescue from height and confined spaces. With the extra equipment and training now available, this enables firefighters to improvise and adapt to any situation, which was evident at a very successful rope rescue that our crews attended in April 2012.

DSFRS responded to an incident involving a teenager who was stuck on a cliff. The watch at

mand Special Skills

the scene set up a Level 1 SHACS system and secured the area. The Level 2 team, which arrived shortly after, was able to make contact with the casualty, where they administered first aid and placed the teenager in an exit harness, using the rescue kit already in place from the Level 1 team. The Level 3 SHACS Specialist Rescue Team completed the rescue by lowering the casualty onto the beach below and to a place of safety, utilising the Level 2 equipment provided by the crews before the team's arrival. Due to the skills and knowledge that the teams had gained during training and by working within their own levels and capabilities the boy was rescued in less than two hours after the emergency call was made.

Water Rescue

In 1999 Sub-officer Paul Metcalfe from Greater Manchester Fire & Rescue Service drowned while attempting to rescue a teenager from a lake. Mr Metcalfe acted on his own initiative and waded into the lake with two colleagues; all three firefighters had ropes attached to their waists. Mr Metcalfe's rope became snagged on branches in the water, trapping him under the water for 15 minutes. His colleagues and a police officer pulled him to safety but he later died in hospital. The teenager also died in the incident.

The drowning of Sub-officer Paul Metcalfe and the teenager marked a turning point and sparked a vital need for fire and rescue services along with other agencies that may be involved in water rescue to undertake further training. It was a key incident that changed the way in which fire and rescue services operate at water rescues, highlighting the need for them to ideally be trained to Swiftwater First Responder level in order to avoid tragedies such as this happening in the future.

The Academy works in partnership with Rescue 3 (UK) to offer the highest standards of water rescue training. Swiftwater First Responder training is designed to provide personnel, who may be responding to water rescue incidents, with the knowledge, skills and understanding of the dynamic water environment. Within Devon & Somerset Fire & Rescue Service all specialist rescue stations are competent at Swiftwater First Responder Technician level. A firefighter who is trained to first responder level will be able only to wade in the water, therefore at challenging rescues the technician will act as a back-up and is able to swim as a last resort in order to rescue casualties. Swiftwater first responders and technicians are able to work side by side and complement each other at dangerous water rescue incidents.

Large Animal Rescue AR2 Responder

It is estimated that, in the UK, fire and rescue services are called to over 2,000 horse rescues each year. Animal rescue training is therefore vital to ensure that fire and rescue services understand the hazards and risks involved at large animal rescue incidents. The Training Academy has trained all 150 internal Specialist Rescue Technicians and now offers courses to other fire and rescue services including Animal Awareness Training to AR-1 standard and Animal Rescue Responder to AR-2 standard, incorporating the animal behaviour element. AR2 training is designed to familiarise responders with the health and safety procedures and operational considerations while dealing with large animal incidents.

The training highlights how other people at the scene can affect the outcome of the rescue and how large animals in distress bring about additional influences that will affect decision making. At animal rescue incidents an overriding regard for the safety and welfare of the fire crews and members of the public must be made.

The priorities at animal rescue incidents are human safety and the removal of an animal from a place of danger to a place of safety by the most humane method. Without training, fire and rescue services could be putting themselves and members of the public in danger. AR2 training arms firefighters with the expertise needed to work safely and effectively, highlighting how animals may react in stressful situations.

To ensure that rescue teams to work together at incidents the Academy also offers Large Animal Rescue and Emergency Training to vets and the course is jointly accredited by the British Equine Veterinary Association (BEVA) and DSFRS. Experience has shown that not all vets are necessarily confident in working in this type of environment; similarly firefighters are not always familiar with the capabilities of vets at an emergency incident. Hence, the need to educate and work alongside the veterinary community in much the same way as fire and rescue personnel work with the police and ambulance service. Training both other fire and rescue services and vets increases safety, resolves incidents effectively, minimises disruption and improves the prognosis for the animals involved.

Training Academy

The Training Academy offers the highest standard of training courses in: access and rescue; firefighter training; fire behaviour; maritime and fire safety. The Academy boasts purpose built on-site facilities including life-like confined space and maritime ship fire fighting scenarios and an accredited live fire training centre based at Exeter International Airport. The Training Academy has trained both national and international delegates and has received excellent feedback on all courses. APF

Jessica King is Training Academy Project Support Officer at Devon and Somerset Fire & Rescue Service

For further information, go to www.dsfire.gov.uk/trainingacademy

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North Shore
Auckland, New Zealand
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PAKISTAN

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ALARM SUPPLY PTE LTD
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Website: www.halchem-lanka.com
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Website: www.pacfire.com.au
Dealer/Distributor

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(Excluding Australia)

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Wanganui 4501, New Zealand
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Email: sales@pacifichelmets.com
Website: www.pacifichelmets.com
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PBI PERFORMANCE PRODUCTS, INC.

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Emergency Services
Tel: +61 3 9353 4552
Email: rob@ada.com.au
Website: www.ada.com.au
Garment Maker

BRUCK
Units 12/13, 79-83 High Street
KEW Victoria 3101, Australia
Contact: Michael Smith
Tel: +61 4 0324 7309
Email: MSmith@Bruck.com.au
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ELLIOTT AUSTRALIA PTY LTD
23 Vauxhall Street, Virginia QLD 4014, Australia
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LION APPAREL – ASIA PACIFIC
Asia Pacific – Protective Systems Group
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STEWART & HEATON
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Villivakkam
Chennai – 600049, India
Tel: 91 44 26174339/26170407
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Email: admin@system5s.com/systement@dataone.in
Website: www.system5s.com
Dealer/Distributor

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Weaver

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Website: www.sancheong.com
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SCOTT SAFETY

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REPORTING TO THE ASIA PACIFIC FIRE PROTECTION AND FIRE SERVICE INDUSTRY

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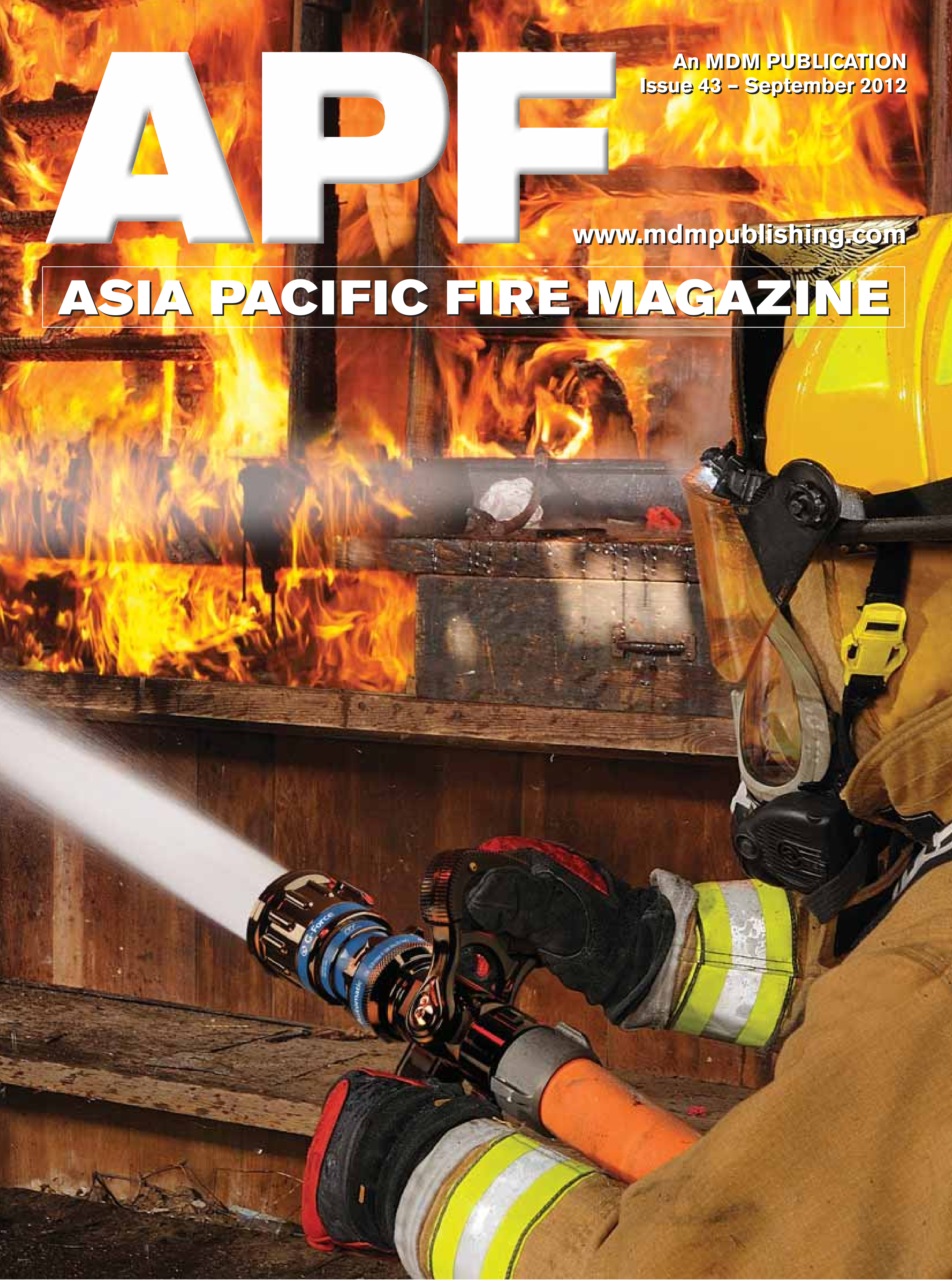
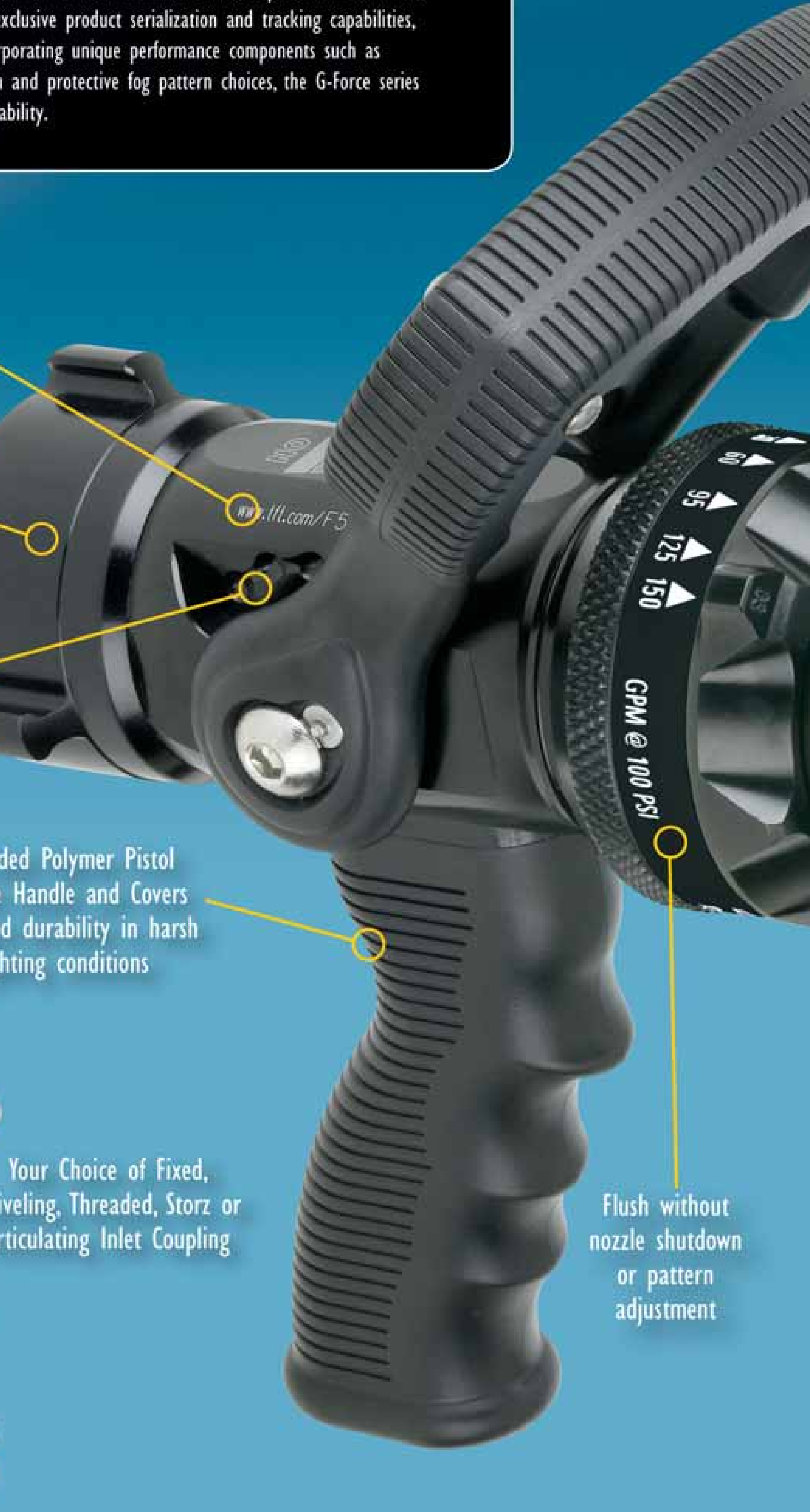


REPORTING TO THE ASIA PACIFIC FIRE PROTECTION AND FIRE SERVICE INDUSTRY

G-Force Nozzles: The Inside Story

Based on a highly customizable global nozzle platform design, the unique G-Force series of fixed, selectable, and automatic nozzles combine over 40 years of Task Force Tips design innovation and experience into true next generation firefighting tools. Manufactured exclusively at TFT's USA production facilities, the G-Force series is supported by an extensive infrastructure of 24-hour technical service representatives, on-line documentation, digital video training library, exclusive product serialization and tracking capabilities, and a proven 5 year product warranty. Incorporating unique performance components such as a stainless steel slide valve, inlet debris screen and protective fog pattern choices, the G-Force series delivers high performance and rugged dependability.



Serialization provides track-ability and immediate access to on-line operational instructions

Integral Inlet Screen prevents debris from entering nozzle and affecting stream quality

Stainless Steel Slide Valve provides turbulence-free flow control when gated

Color-Coded Polymer Pistol Grip, Valve Handle and Covers offer rugged durability in harsh firefighting conditions

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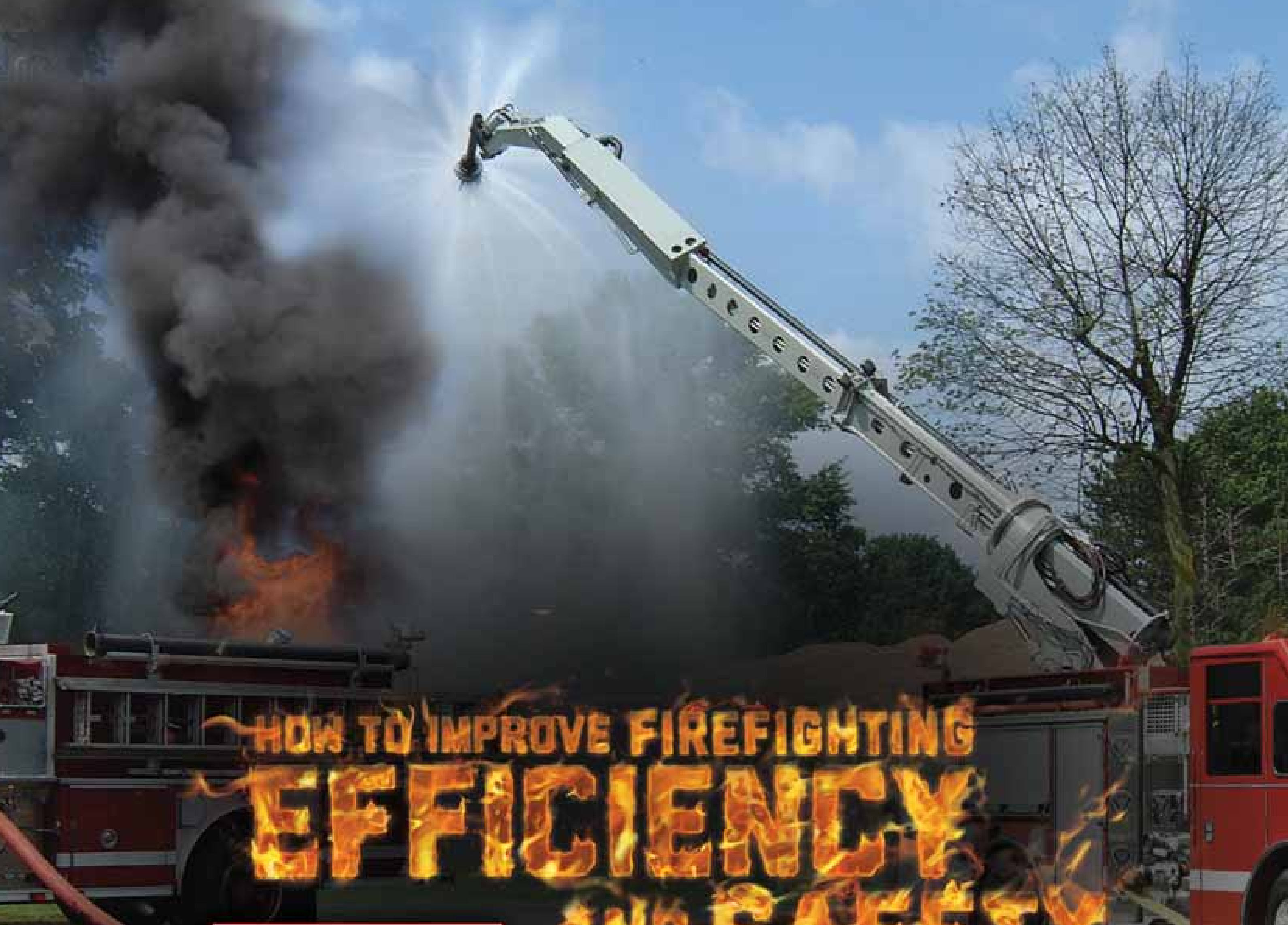

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September 2012
Issue 43

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ASIA PACIFIC FIRE MAGAZINE
REPORTING TO THE ASIA PACIFIC FIRE PROTECTION AND FIRE SERVICE INDUSTRY

The G-Force fixed, selectable and automatic, highly customizable global nozzles, combine over 40 years of Task Force Tips experience into true next generation firefighting tools

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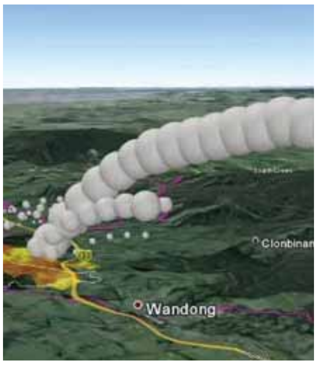

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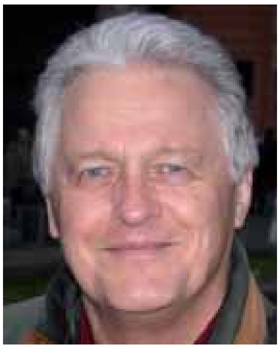

By Graham Collins

The Season is Upon Us

Bushfires, wildfires or forest fires are by no means new and while changing global weather patterns undoubtedly have a part to play, archaeologists and geologists have discovered evidence to show that the world has been plagued by them throughout its history.

That being said, there was a time in more recent history – and not too long ago – when they seemed to be more or less confined to a few unfortunate countries and regions. They did occur in other parts of the world now and again, but were usually seen as very occasional if alarming events. Those days seem to have been well and truly confined to the history books.

Today, these fires are cropping up with ever more frequent regularity in just about every corner of the globe. According to the National Oceanic and Atmospheric Administration's National Climatic Data Centre, in July the USA experienced 9,869 wildfires that destroyed 2,014,395 acres. In the year to date 37,576 fires in the USA devastated 4,088,349 acres. In the past month alone, significant wildfires have broken out across the Asia Pacific region in Malaysia, Thailand, Sri Lanka, Indonesia, Vietnam and Pakistan.

Many wildfires though are unmonitored and undocumented so the full record of wildfires around the globe is a long way short of complete. However, the World Health Organisation's international disaster database estimates that 2,000 people have been killed and US$49 billion lost in 339 major fires worldwide since 1970, making them among the world's costliest disasters. The United Nations Office for the Coordination of Humanitarian Affairs is on record as stating that weather conditions, wind and terrain conditions all contribute to fire risk but, alarmingly, humans started most of the past decade's wildfires.

Right now parts of Australia, for example, are bracing themselves for what the experts are predicting will be a high risk bushfire season. Bushfire CRC (Cooperative Research Centre) has identified large areas of southern Australia, from the east to west coast, as having above average fire potential this summer. Its latest seasonal outlook concludes: "The above average forecast is due to the abundant grass growth from the high amount of rain from two strong La Niña events seen in the past two years across the country's eastern seaboard and South Australia. Fuel moisture content within forests is still high, but this rainfall has continued to provide widespread vegetation growth in the grasslands, which remain a threat."

Such a scenario was the focus of attention of many of the delegates from across the world to the recent annual AFAC (Australasian Fire & Emergency Service Authorities Council) and Bushfire CRC conference in Perth. The conference (which is reviewed in more detail one page 13 of this edition of Asia Pacific Fire) showcased the work that scientists and firefighters are undertaking to more accurately predict where these fires will occur, how to most effectively monitor and track them and, of course, how best to defeat them.

Understandably, the often frightening scale and environmental impact of a bushfire or wildfire and the consequential human tragedies tend to grab the news headlines. However, it must never be forgotten that those involved in front-line bushfire and wildfire firefighting activities – both professional firefighters and the many volunteer firefighters involved – face an assortment of serious health related risks. This is why in this and recent editions of Asia Pacific Fire, and in our sister publication International Fire Fighter, editorial attention has focused on a broad spectrum of firefighter health and safety issues. For instance, in this edition of the magazine we are addressing the serious challenge of heat stress on firefighters, while the current edition of International Fire Fighter magazine carried a research article on protecting firefighters' respiratory systems. These, and similar subjects, are topics to which we will undoubtedly be returning in coming editions. APF

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Gary Keith

NFPA

Social Media & International Outreach

No one was more surprised than I was when, a few years ago, I agreed to test an iPad for NFPA's Information Services Division and actually ended up liking it.

Like millions of others around the world who spend a lot of time on the road, I rely on applications that can organise work communications and files when I am away from the office and make meetings more efficient, such as the personal digital assistant (PDA) application for NFPA's Conference & Expo.

I like not having to lug around a laptop when I travel, and I have come a long way in the brave and binding digital world. But I admit, I am still a holdout on social media.

Actually, that puts me in the minority. The number of people using social networks globally has nearly doubled since 2008. According to a recent survey by the Pew Research Center, 79 percent of American adults say they use the Internet. And 59 percent of Internet users say they use at least one social networking site, mostly Facebook.

Social media presents fire and life safety educators with valuable and growing access to their audiences, helping to spread the word about the need for more fire and life safety legislation around the world.

Even if I am slowly inching my way into social media, I readily acknowledge that it presents fire and life safety educators with valuable and growing access to their audiences. This is even more evident as NFPA continues to reach out to the international community.

Whether it is reaching the "digital natives" of the millennial generation (my three children, for example) or higher-risk populations such as older adults, social media can expand our reach in order to better educate the public about fire safety. The American Association of Retired Persons' (AARP) research found that two-fifths of adults over age 50 in the United States consider themselves extremely or very comfortable using the Internet. Approximately a quarter use social media websites.

These online tools can also help us spread the word about the need for more fire and life safety legislation around the world. Because these tools are so nimble, they are ideal for addressing the on-going worldwide fire problem and for quickly sharing both successes and areas for improvement.

NFPA recently topped 31,000 Facebook fans and has a strong Twitter and LinkedIn presence. Interestingly, LinkedIn has an enthusiastic international participation with many of its members from outside the United States. In addition, 45 percent of NFPA's Facebook fans are also from outside the U.S. It is rewarding to see the tremendous international interest and communication exchanges on fire and life safety issues using NFPA's social media throughout the world. We hope to continue to strengthen international activity throughout our varied social media programs and welcome APF readers to become active participants.

We have had the opportunity to share in previous issues of APF two important initiatives at NFPA with tremendous interest from our international constituents: *Fire Wise Communities* and the *Electric Vehicle Safety Training* program. NFPA's *Fire Wise Communities Program* offers an updated website, www.firewise.org, with social media integration. *Fire Wise* is fairly new to social media, but it is already finding a strong and growing base of interest including international audiences. In addition, the *Electrical Vehicle Safety Training* program, www.evsafetytraining.org is also somewhat new to the social media outlets but we are seeing increasing interest, particularly from one of the most global industries, automobile manufacturers.

We may not yet have an app that can solve the new challenges of fires, but as these examples demonstrate, we certainly have a much broader array of educational tools available to us today to fight those fires.

Become a fan of NFPA on Facebook or follow us on Twitter at @NFPA.org APF

Gary Keith is NFPA's vice-president for Field Operations & Education, and is vice chair of the Confederation of Fire Protection Associations – International (CFPA-I)

For further information, go to www.nfpa.com

Intelligent Fire Suits

Marine and fire safety equipment company, VIKING LIFE-SAVING EQUIPMENT has added technology to its range of fire suits that enables them to detect if a firefighter is in increased danger as things heat up. Every VIKING suit can now be ordered with the option of adding the company's thermal sensor technology (TST), which provides firefighters and those around them with clear warning signals as temperatures increase.

The company says that research shows that heart attack due to heat stress is the leading cause of death among firefighters in action, and that Viking fire suits equipped with TST technology are designed to reduce some of the factors that cause heat stress. Temperature sensors attached to two displays on the arm and shoulder indicate to firefighters and their teams critical temperatures, both inside and outside the coat.

Paradoxically, the company says that its technology is partially an answer to a problem that arises because today's fire suits have become so good at protecting their wearer. The heat insulating textiles in modern fire suits, together with other equipment, protect the skin so well against radiant heat that it is becoming a challenge for firefighters to detect critical temperatures in the critical minutes before they result in injury. If heat increases rapidly, the TST technology equipped suits generate a warning signal much more quickly than if temperatures are slowly rising, recognising that when things are heating up fast, firefighters need to exit more rapidly.

The TST microelectronics are durable and can be washed in a washing machine once the small computer/battery pack has been removed from an inner pocket. Beyond replacing the AA batteries, no further maintenance is required.

For more information, go to www.viking-life.com

Star Performer

DELTA FIRE AUSTRALASIA has installed the latest-technology kitchen fire protection systems at a number of the high-profile eateries at The Star, promoted as being Sydney's newest entertainment destination.

All now rely on what Delta Fire believes is the world's most frequently installed kitchen fire protection solution, the Ansul R-102 system – a pre-engineered system that meets all of the relevant Australian and international standards. R-102 is an automatic system that quickly detects and suppresses a kitchen fire before it has time to take hold, utilising a suppression agent that was specially designed for kitchen applications, offering fast flame knock-down, vapour securement, and the ability to cool hot surfaces and cooking oils. In addition to being non-corrosive, post-fire clean-up calls for no more than flushing the affected area with water or steam, helping to ensure that the kitchen is back in full operation in the shortest possible time.

The system protects both the cooking appliances and the hoods and ductwork, and does not demand manual intervention; it can be triggered automatically or manually. Immediately the system detects a fire, the gas or electric power to appliances is cut-off prior to suppressant discharge.

For more information, go to www.deltafire.com.au

Aerial Firefighting

CAYLYM TECHNOLOGIES INTERNATIONAL has recently carried out demonstrations of its new Guardian System that the company says introduces a new capability for fighting wildfires from the air, and particularly at night.

The system was built on the Precision Container Aerial Delivery System (PCADS) platform and now boasts a capacity in excess of 1,000 litres. This is over 15 percent larger in volume than earlier PCADS systems. Almost any cargo plane with rear ramps – including most commonly the C-130 Hercules military cargo plane and cargo helicopters – can use the system to precision drop the units that are approximately 1.2-metre cubed, using GPS 24 hours-a-day. At night, the system can be dropped using GPS precision from a safe altitude flying a level profile to the target.

The recent test drops in Arizona involved three guardian units, each containing 3000 litres. The saturated area was larger than a football field – over 4,000 square metres.

The Guardian unit complies with standard and internationally recognised Container Delivery System (CDS) protocols adopted by international and domestic air drop units.

For more information, go to www.caylym.com

Achieving Building Management Systems Integration

As technology in all areas of our lives becomes increasingly more integrated, Eva Kosanovic, Head of Product Management at Apollo Fire Detectors, explains why we should be expecting the same from our fire detection systems.

In the past, facilities managers were faced with the challenge of trying to run a site at maximum efficiency with a host of independent systems. Thankfully, as technology has progressed, security, heating, lighting and ventilation can now all be combined into a single, integrated building management system (BMS). However, full fire detection integration has, to date, been difficult to achieve. There are sound reasons for this, largely stemming from the risk of having a safety critical system linked to those that are not, and the special work involved in integrating the system. Generally, fire detection systems are subject to much stricter standards than other BMS but this need not mean that integration is not viable.

The Practicalities of Integration

While it is important that fire detection devices should be physically separate from other building services equipment, there is no reason closer information integration should not be pursued. But other than convenience, what advantages does full integration bring? In essence it can make all of the building technology work harder and smarter. Faster response times, co-ordinated strategies in case of emergency or failure, and pre-planned and pre-programmed evacuation procedures are among the most effective results of inter-system communication.

What we have witnessed to date with attempts at fire detection integration are complex bespoke solutions. As commercial buildings become larger and more complex, continually adding more physical devices to link building services together becomes increasingly impractical.

Never one to back down from a challenge, Apollo firmly believed that a solution was possible. It went back to the drawing board to engineer a product that allowed for easy and efficient fire system integration while, most importantly, allowing the equipment in place to provide reliable detection.

Opening the Door to Successful Integration

OpenConnect is Apollo's solution – a deceptively simple, off-the shelf gateway product that takes information from a fire alarm control panel and connects it to a building management system using standard protocols such as BACnet, Modbus or LonWorks. The device is effectively a 'plug and play' concept that offers many practical and cost benefits to panel manufacturers, installers and end users.

At the heart of the hardware is the Tridium JACE, designed in conjunction with the well-established Niagara AX Framework, to provide easy physical integration to a host of established networks. The versatility of the OpenConnect standard allows participating fire panel partners to adopt and seamlessly integrate their equipment into building monitoring, automation and control systems using the gateway.

The system has been developed to make life easier for those using BMS. Right from the start, OpenConnect saves time and money – integration of the system can be performed by a contractor as no specialist engineering tools, re-engineering or bespoke drivers are required and full configuration can be achieved in under five minutes. There is also no need for modification of devices used in conjunction with OpenConnect-enabled control panels. Thanks to each box having its own IP address, system modification can also be performed remotely, meaning fewer call out charges. A web-based graphics package is also included through each JACE. OpenConnect means end users will enjoy full integration of the fire system and reduced cost through the use of standard software and a single interface, while the integrity of the fire system remains assured.

OpenConnect is available in four base model options: 200 BMS, 1,600, 12,000 and 25,000 BMS points. For maximum integration, each OpenConnect Gateway includes two Ethernet ports, an RS232 and RS484 port, a 15V dc input and two spare comms card slots.

The development of OpenConnect means that fire detection systems evolved for the purpose of protecting lives and property are no longer excluded from working in synergy with other building technology, resulting in a better outcome for everyone involved in the installation and management of these systems. APF

For more information, go to
www.apollo-fire.co.uk

Foam Approval

The UK's largest airport operator, BAA has awarded Dr Sthamer the firefighting foam contract for its Moussol FF, a fluorine-free firefighting foam that has been tested and certified to pass the requirements of the International Civil Aviation Organisation's Level B standard. This included independent verification of the firefighting performance to the ICAO Level B standard at the CNPP Laboratory witnessed by UK CAA and BAA personnel.

Dr Sthamer's Moussol FF foam was developed to meet the stringent requirements of the aviation industry and BAA's environmental requirement to be 100 percent biodegradable within 28 days. This allows the airport rescue fire services to train with the actual foams they will respond with in real fire scenarios. The foam is already in use at London Gatwick and Southend Airport in the UK and all of Norway's and Sweden's airports and Finland's regional airport.

For more information, go to www.sthamer.com

High-Flow Compact Pump

HALE PRODUCTS has unveiled the Qmax-XS, a new concept in compact, high litres-a-minute pumps that are capable of flows exceeding 11,500 litres-a-minute, Qmax-XS has a one-piece, compact body profile that minimises piping requirements and increases premium storage space on an apparatus. The design of the Qmax-XS allows it to be installed in a pump module as small as 860mm wide with manual valves or 700mm wide with electric valves. This gives firefighters the ability to knock down large fires, plus have body side compartment space for tools and EMS equipment.

Qmax-XS is engineered to go beyond the 8,500 litres-a-minute NFPA rating and exceed 11,500 litres-a-minute from a sufficient positive pressure water source along with an appropriate engine. Its double suction impeller with dual cutwater design reduces shaft loading for long life while increasing suction performance and efficiency. The pump's one-piece upper body minimises potential piping leaks, and makes maintenance and servicing easy.

Other features of the Qmax-XS include: 12 standard 100mm discharge ports; tank to pump connections; large suction inlets; and close-supported impeller. Additionally, it is available with three heavy duty gearbox options: The Hale G-Style gearbox, the Hale K-Style gearbox and the Hale GXS Gearbox.

For more information, go to www.haleproducts.com

FM Approved Sprinkler

The VIKING CORPORATION has introduced a new FM-approved version of its dry ESFR (Early Suppression Fast Response) pendent sprinkler. The new model VK502, which complements Viking's existing UL Listed model VK501 dry ESFR sprinkler, is claimed to eliminate the need for in-rack sprinklers and a dry or pre-action system in certain freezer and cold storage applications.

Viking's ESFR sprinklers, which must be installed on a wet-pipe system, are suitable for cold storage facilities where the system piping is installed in a heated space above the freezer area. In these applications, the VK501 (UL) and VK502 (FM) sprinklers reduce the installed cost of a fire sprinkler system by providing ceiling only protection, without the additional costs associated with a dry or pre-action system, including an in-rack sprinkler system, detection system, air maintenance system, low point drains, and other components.

Each dry ESFR sprinkler is shipped with two insulating boots. These boots, which are installed above and below the ceiling penetration, help to seal the clearance space around the sprinkler's barrel, decreasing the potential for condensation and ice to build-up around the sprinkler. Both the VK501 and VK502 are offered in a single barrel length of 900mm. The 74°C sprinkler is available with a 50 mm grooved or 40 mm threaded connection.

For more information, go to www.vikinggroupinc.com

Get Snapping

To celebrate the 40th anniversary of the development of the first hydraulic cutter, which revolutionised rescue work, LUKAS is holding a photography competition. The company is looking for photographs showing historic Lukas tools in action, firefighters, or personal memories that are associated with Lukas equipment.

The deadline for entries, which can be either photographs or digital shots, is September 28th 2012. The three most impressive photos will be selected by a jury and will win valuable equipment. The best photographs will also be published on the company's website from October.

For more information, go to http://rescue.lukas.com/Photocompetition.html

Staying a Cut above the Rest

Advances in new car technology over the past twenty years have had a huge impact on how we think about rescue. We all acknowledge that vehicles are much stronger, have wider profiles and react differently both during the collision and the extrication process. However, rescuers themselves, and the tools they use, have advanced at an even greater pace. An amazing achievement for rescuers, when considering that training on new vehicles is nearly impossible.

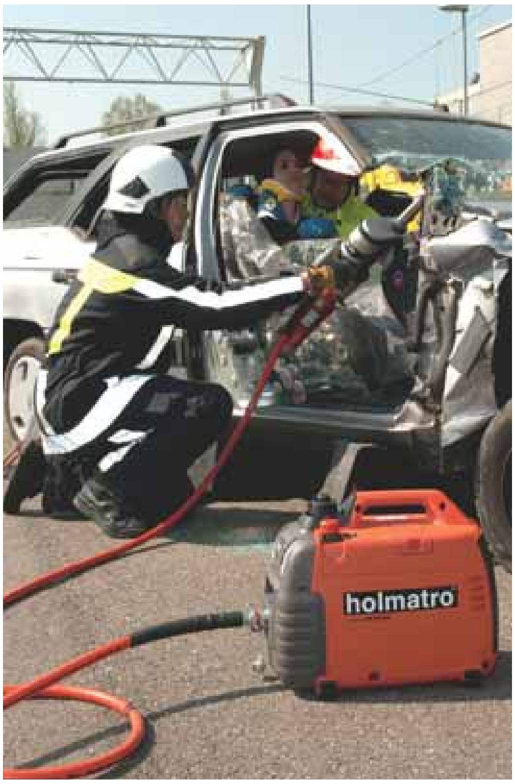
More and more rescuers around the world now use the 'extrication challenge' concept as a platform for learning and improving their performance. This year, the World Rescue Challenge will be held in London, England and will attract teams from around the globe. This event, and similar national and regional competitions, promote the "team approach' to road traffic collisions. This method gives rescuers a standard approach that can be used for any type and number of vehicles and casualties involved.

Equipment too has been developed with new car technology in mind, and we have tools specifically designed to operate on the latest vehicles, both in terms of overcoming increased strength and larger profile construction. This ability to get through the latest strength with wider blade opening capacity means that the number of cuts on scene is reduced, making extrication quicker.

Cutters and spreaders that are light and ergonomic lighten the physical burden on rescuers. These smaller, lightweight tools are easier to control, of course improving the safety of the handler. Rams that manually extend before they use hydraulic force mean that physical entrapment can be removed far quicker.

Manufacturers are committed to reducing time on scene, which is why we now have single hoses and couplings that can be changed under flow with one hand in the standing position, again reducing the impact on rescuers. These single hose systems are quicker to deploy, easier to manage on scene, and far quicker to make up and restore on the vehicle, making the scene a safer environment.

Hydraulic pumps advances now see three-stage units delivering more oil at critical pressures, allowing more tool speed. They are also casualty friendly due to very low noise output; this allows casualty assessment to go on, uninterrupted throughout the space creation phase of the rescue.



Do not forget the smaller tools – glass management tools, seatbelt cutters, stability blocks, sharp edge protection covers and tools for exposing interior trim prior to cutting. Without these assist tools, extrication would be less safe, much more difficult and take far more time.

There is no doubt that new car technology will always move on at a great pace. They will continue to get stronger, use more advanced materials and offer challenges and it will always be difficult to obtain brand new vehicles for realistic training. However despite this, and if the past is any kind of benchmark, rescuers will continue to stay ahead of the game by continuing to seek out the best methods of extrication, and by using the correct tools, which are specifically designed with new car technology and the rescuer in mind. A good place to start is by forming your own team and taking part in the extrication challenge events. APF

For more information, go to
www.holmatro.com

Flexible CBRN Training

ARGON ELECTRONICS has launched the latest version of PlumeSIM CBRN/HazMat response training simulator that offers enhanced flexibility and ease-of-use in field exercises and table training for counter terrorism, HazMat or nuclear incidents.
The PlumeSIM software, which is used with Argon chemical and radiological detector simulation instruments, enables users to plan exercises on a PC or laptop without system hardware, offering a portable simulation system with easy-to-use menus that can be swiftly set up and used to create a virtual emergency scenario.

PlumeSIM brings great flexibility to the planning of CBRN/HazMat emergency training exercises. It enables an instructor to plan a scenario that involves single or multiple releases of hazardous materials and offers the potential to define a series of release characteristics, such as duration, direction, persistence and deposition, from a variety of substances. The instructor setting the training exercise can even define the environmental conditions that would affect the movement and/or state of the virtual plume during the timespan of the operation.

Trainees can interact with Plume SIM in three modes: table-top mode, field exercise mode and post-event exercise review mode. Table -op mode offers the opportunity for trainees to navigate a scenario using a standard gamepad controller, offering a familiarisation with the simulation that enables trainees to gain more from the subsequent field training exercises. Field exercise mode enables students to investigate a training area physically, while PlumeSIM triggers readings and alarms on the simulation tools they carry by tracking their progress using GPS data relayed from personal player units. Finally, post-event exercise review mode enables all player movement and simulator activity to be reviewed by instructors and trainees at debriefing, maximising the potential for students to learn from their experiences.

In addition to its flexibility and ease-of-use, the modular Argon Plume SIM system is also cost-effective for end-users, since the number of simulation tools used can be expanded as and when budgets permit, and because all simulators can be used independently of Plume SIM there is no redundancy of equipment. Existing users of Argon detection simulation instruments are able to upgrade their equipment for use with PlumeSIM.

For more information, go to www.argonelectronics.com

21st Century Rescues

RESQTEC is claiming to be the first manufacturer of hydraulic rescue equipment able to deal with the real challenges encountered when extricating a victim trapped in a car built in the 21st century.

In recognising that the number of cars with an NCAP star rating grows by the day, ResQTec tests its equipment on several NCAP 5 star rated cars. ResQTec also recognises the growing number of armoured cars on our streets today. However, the difficulty with armoured cars is that they cannot be distinguished from the outside or inside when compared with regular cars and the materials used in armoured cars are a huge challenge in extrication.

The test included an armoured Audi A6 and a variety of ResQTec hydraulic tools: the G6w cutter, the X4 spreader and the telegram V5t. The recently introduced G6w is equipped with 1200kN of cutting capacity, a blade opening of 200mm and weighs only 17.5 kg, making it the lightest tool in its class for heavy duty cutting such as armoured cars. Like all other RESQTEC equipment the G6w has the UltimatePressure technology incorporated eliminating the forces travelling through the blades. This technology proves that, even in its first stage cutting capacity (350bar), it cuts armoured cars in a smooth and controlled motion, eliminating any unnecessary movements to the object being cut and therefore eliminating the chance of possible additional injury to the trapped victim.

The X4 spreader (1010kN spreading force and 700 mm spreading opening) was included in the test to create sufficient space for the G6w cutter to reach the hinges of the door. The V5t ram with 202kN spreading force in first stage also proves it can cope with the strong and thick armoured car materials. The hydraulic ram is useful in situations where dashboard rolls are required to release the victim.

For more information, go to www.resqtec.com

Industry First Sensor

Claimed to be the industry-first CO/NO2 XCell sensor for Altair 4X Multigas detectors, ideal for monitoring for diesel emissions, has been unveiled by MSA. The new CO/NO2 XCell sensor provides a range of 0-2000 ppm CO and 0-50 ppm NO2, 1 ppm and 0.1 ppm resolution respectively. The sensor's fast response time allows users to bump test in less than ten seconds and perform full span calibration in 60 seconds.

For more information, go to www.msasafety.com

Sharing Knowledge & Experience

The 2012 AFAC/Bushfire CRC Conference

If the AFAC/Bushfire CRC Conference in Perth, Australia demonstrated one thing, it showcased the sheer volume of the endeavours that are going into improving resilience and response to fire. The amount of expert research that is coming to fruition is awesome and most certainly encouraging for those seeking to better understand how to protect lives, property and the environment across the Asia Pacific region.

Firefighting and emergency management is undoubtedly getting tougher, but thankfully senior officers and policy makers have never before been so well armed with scientifically valid guidance on policies and procedures. More and more, firefighting and emergency response operational decisions are being based on research, substantial volumes of which is collaborative – particularly at strategic levels – across the globe. Just a quick glance at the scores of AFAC (Australasian Fire & Emergency Service Authorities Council) and Bushfire CRC poster abstracts displayed at the Perth Conference demonstrates the depth and breadth of these world-class achievements.

The way we live ensures that fire will remain a daunting fact of life. The processing, storing and transportation of highly flammable and often highly toxic substances upon which manufacturing processes and our way of life increasingly depend means that the risk is on-going. This risk is further increased by the manner in which the urbane environment is being developed, particularly – but by no means exclusively – in the developing nations. In this respect the AFAC/Bushfire CRC Conference this year made a significant contribution to understanding the importance of being problem focused when embarking on research, developing new thinking and devising solutions.

The theme of this year's conference: "Diverse country. Common ground." aptly encapsulates that challenges faced by many countries in the Asia Pacific region. In the past couple of years the region has faced what appears to be more than its share of natural disasters, ranging from the Japanese nuclear disaster following an earthquake and tsunami, the Christchurch earthquake in New Zealand, and the flooding of vast tracts of south-east Queensland in Australia. Diverse country being the only term to describe what is possibly the world's most climatically, metrologically and typographically varied region; common ground highlighting the need to appreciate that fire-fighters and rescue personnel face the same challenges, underpinning the need to share research, experiences, procedures and techniques.

Despite the first day of the conference being devoted to a Research Forum, this was most certainly no academic or ivory tower talking-shop event. It brought together all sides of the industry to share knowledge and experience. In an environment where the word emergency is spelt with a capital E, this is a major achievement. All too often, those at the sharp end of firefighting and emergency response understandably have to dedicate 100% of their attention on today's challenges, while those involved in formulating policy or deciding on resources are often embroiled in responding to aftermath of the latest disaster.

The three-day conference also comprised a number of Panel Sessions with topic spanning from the future of emergency management to good practice in urban firefighting, and from public safety and bushfires to developing and implementing community engagement programs. The 1200 or so delegates also had the opportunity to sit in on dozens of individual presentations, many of which were given by world-renowned specialists in their particular field of expertise. Significantly for those unable to attend the Perth event or because presentation timings clashed, all of these presentations can now be viewed online at the AFAC Knowledge Website at http://knowledgeweb.afac.com.au.

In addition to the main conference, the event was preceded by the option of field research trips and followed by a day devoted to a professional development programme. An exhibition ran alongside the conference where over 100 companies from around the world showcased the latest developments from market-leading brands in personnel protection equipment, firefighting vehicles and suppression technology. APF

For more information, go to
www. afac.com.au

Emergency Services Show

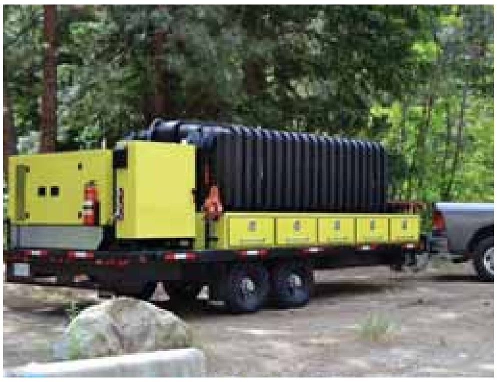
The EMERGENCY SERVICES SHOW 2012 is being heralded as the key event for anyone involved in fire and rescue, emergency planning, response or recovery, both in the UK and abroad. This year, the event will take place on Wednesday 21st and Thursday 22nd November at Stoneleigh Park, Coventry, UK.

The event is the ideal place to explore new ideas and initiatives to help deliver effective firefighting in a range of environments throughout the world such as refineries, airports and wildfires. Worldwide flooding, and the latest blackout in northern India, have tested the world's emergency services as they battle to implement emergency plans and re-establish order throughout large communities. The Show is an ideal platform for fire and rescue services to share experiences and learn from other emergency professionals. Networking and collaboration with suppliers, colleagues and contemporaries is an essential part of ensuring an emergency is dealt with as efficiently and effectively as possible. Every year chief fire officers, operations managers and emergency planning officers with a role in operations, procurement, training and recruitment attend.

Bristol Uniforms, Devon and Somerset Fire and Rescue Service, Volvo Trucks, Dräger, Angus Fire, Vimpex, Scott Safety, Fire Service College and TEEX will be among 300 exhibitors on hand to demonstrate their latest innovations and developments. The show's Emergency Response Zone will once again feature exhibitors from fire and rescue, police, ambulance, government and voluntary organisations from around the UK. This area demonstrates to visitors the capabilities of partnering agencies and the voluntary sector.

For more information, go to www.emergencyuk.com

Unmanned Wildfire Suppression



WASP MANUFACTURING has launched a new tool to help battle wildfires – the Wildfire Automated Suppression and Protection System or WASP, an automated wildfire protection system. The new equipment helps free up ground crews, can be deployed in the bush, or anywhere there is an urban interface to protect homes and commercial structures. As long as it is hooked up to water, whether it is a lake or a fire hydrant, it can be started from any cell phone or laptop, anywhere on the planet.

Mounted on a trailer, the completely self-contained unit provides a 25,000 watt diesel generator, powerful pumps and over 900 metres of line with 30 sprinkler heads. The Wasp can be towed to a location by most full sized pickup trucks, and be easily deployed by two operators within 45 minutes.

When firefighters are pulled out of an area for safety reasons, the Wasp can be left behind, where it can pump water continuously for up to five days without supervision. The Wasp can also be used to provide emergency lighting and power, and can move extremely large quantities of water great distances in flood situations.

For more information, go to www.waspwildfire.com

UL Compliant Voice Messaging

FIKE has announces that its CyberCat platform with integrated voice messaging is now 100 percent compliant with the UL 2572 Standard for Mass Notification Systems, claiming to be the only fire alarm manufacturer currently listed to this new standard.

The system is said to have several key products and benefits that, along with the listing to UL 2572, make it an ideal foundation for mass notification (MNS) or emergency communication (ECS) systems that are designed to integrate fire, security and communications systems for immediate, responsive and effective notification of fire, weather, intrusion, and many other important emergency situations.

For more information, go to www.fike.com

SOLO TI Tic Gets Personal

The S2 Personal has been designed as a high specification, low cost thermal imager to equip firefighters with intuitive thermal imaging technology. Using the UK designed and manufactured SOLO TI camera core means less restriction and greater control, as SOLO TI manufactures every single part of each S2 Personal. Designed as an ultra-small form camera, small enough to easily clip to firefighters' gear, nomex side hand straps complete the rugged external features.

The S2 Personal is one of the world's smallest, lightest hand-held cameras weighing only 750 grams including battery, yet still manages to utilise a large format, high definition display. This feature of the display offers sharper, brighter image definition than a standard display as found in many hand-held imagers. All S2 Personal cameras have the ability to capture and store in to the on-board memory up to 1000 images with the press of a button and this capability is essential for use as evidential proof or during training exercises. Each camera is also provided free of charge with SOLO TI analysis software, which offers greater detail and colour mapping to be extracted from the downloaded images.

High Resolution/High Definition Imaging

The S2 Personal shell utilises a fire retardant polymer material and includes power pack and locking configuration with further protection offered by the oversized nomex side handles and vulcanised rubber screen shroud. The S2 Personal is offered with our high resolution/high definition sensor, the same SOLO 5200Ti camera core platform as used in the entire SOLO TI camera range and this format offers both greyscale and four colour options as standard.

Fully Loaded Standard Specification

Although the S2 Personal FIRE is a low cost unit, it most definitely has a high end specification. Each S2 Personal FIRE comes as standard in an IP67 hard shell carry case, with four rechargeable batteries with charger and all leads, replaceable display window, direct spot temperature and digital read out with temperature scale running along the right hand of the display, battery gauge, four colour maps, SOLO TI Scene Capture with SOLO TI software – all as standard features. User preference start up screen with on screen menu offered in various languages and a choice of shell colours complete the standard issue specification. Optional extras include a neck strap and retractable lanyard; the S2 Personal can also be specified with either one or two button operation.

Low Cost Maintenance, High Level Warranty

In keeping with the client cost save policy at SOLO TI, we have maintained low price replacement parts and an example of this is the battery replacement cost of only £40 and a complete charger the same. The S2 PERSONAL comes with the standard SOLO TI life time manufacturer warranty with a standard two-year electronic components warranty. APF

For more information, go to
www.solo-ti.co.uk

New Warning Signal Towers

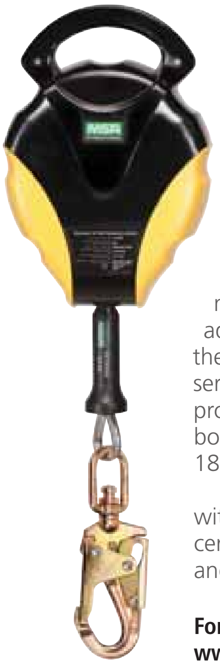
Warning signal manufacturer, E2S, has developed the IP66 sealed STA and the STB user-configurable warning towers. The construction is modular, comprising a separate termination enclosure fitted with two M20 cable entries and up to five unpopulated housings.

The assembly is available in grey, red or white. A STA audible-visual unit consists of up to four high performance L101 beacons and a 100dB(A) SONF1 10-tone sounder; the STB version has up to four beacons without the sounder. A pre-configured wiring loom interconnects the housings, enabling the units to be populated easily and configured as they are installed on site. The units are designed for use in fire and gas systems and any application where a loud audible or audible-visual warning signal is required. The sounder generates the three UKOOA/PFEER standard tones, allowing it to be installed in non-hazardous areas such as accommodation modules and canteens in onshore and offshore facilities.

The beacons are available as either 200cd Xenon strobe units or 120cd high intensity LED units, both with a choice of amber, blue, clear, green, magenta, opal, red or yellow lenses. The two-stage sounder has an effective range of 30 metres at 1kHz. Nominal operating voltages are 12VDC and 24VDC and 115VAC and 230VAC. The units can be wall or bulkhead-mounted using external lugs, or secured directly to a standard conduit box through the rear face of any of the housings.

For more information, go to www.e2s.com

New Lanyard Option



MSA's Workman self-retracting lanyard is now available in new 15-metre length for the added mobility. It has a lightweight, durable thermoplastic housing for years of dependable service, and RFID-enabled product simplifies product tracking and inspection. The Workman boasts an ergonomic carrying handle and 180kg working capacity

It is also available in a nine-metre length with galvanized or stainless steel lifeline, certified to ANSI Z359.14 2012, CSA Z259.2.2 and meets all OSHA requirements.

For more information, go to www.MSAsafety.com/WorkmanSRL

New Engineered Total Flooding System

FIRETRACE INTERNATIONAL has unveiled its new Engineered Systems, which it predicts will redefine the global total-flooding gaseous fire suppression market.

In addition to incorporating a number of innovative engineering developments, the new Engineered Systems from Firetrace are said to offer system installers greater flexibility, speedier installation, significantly lower overall installed cost and a measurable competitive edge. End user benefits come in the form of a lower financial outlay when compared with other systems on the market, significantly improved design freedom, and a swift, least-cost transition from an existing Halon system to the latest clean agent technology and delivery solution.

Firetrace's Engineered Systems offer 500 psi (34.5 bar) high pressure efficiency while utilising low pressure hardware. The system is designed to slash the amount of piping used, with savings on distribution network alone being quoted as typically between 25 percent and 40 percent. At the same time, the bugbear of having to accurately equally balance the amount of agent at Bull T and Side T connections has been overcome, plus extra pipe lengths between tees is either minimal or completely unnecessary. With Engineered Systems, the Bull T split can be up to an 85/15 split, while the Side T can be as much as a 95/5 split.

The actuation system has been designed to be stackable, and the cylinder storage problems often associated with gaseous total flooding systems have been overcome. With the new Firetrace offering, the distance between the agent storage cylinder and the discharge nozzle is claimed to be more than three times longer than old-technology systems on the market, significantly increasing the vertical distance capability. The liquid agent to pipe volumes are up by 500 percent; and higher fill density means more agent in the same hardware. All of this is achieved without the need to incorporate expensive Nitrogen driver systems, so installing the largest possible networks without having to resort to incorporating extra equipment.

Firetrace believes that as many as 75 percent of existing Halon distribution networks can be easily and cost-effectively refitted with its Engineered Systems utilising the existing piping. Its Engineered Systems fully comply with every aspect of NFPA 2001: 2012, the standard on clean agent fire extinguishing systems.

For more information, go to www.firetrace.com

2012 IWMA Conference Goes to Barcelona

The past 15 years have been distinguished by significant advancement in the commercial application of water mist fire suppression technology throughout the world, so the 2012 IWMA conference in Barcelona, Spain in November has much to offer.

The Montreal Protocol opened the way for water mist technology as replacement for Halon. More than a decade of research and development on water mist systems has revealed a broad variety of applications where this technology can replace not only ozone depleting chemical agents; it also represents a measure equivalent to standard sprinklers. The undisputed environmental advantages embodied in water mist systems combined with efficient firefighting characteristics will certainly contribute to its continued success in the future.

The IWMA

Some years ago a logical conclusion of the continuous development of water mist technology throughout the world was the creation of the IWMA – the International Water Mist Association. For more than ten years the IWMA has supported research, development and the use of water mist technology worldwide. Until then the IWMA provides a platform and a forum for all interested parties active in this field; manufacturers, distributors, insurers and approval bodies, research bodies and private individuals.

The on-going success of water mist systems will strongly depend on reliable codes and standards. IMO has been the driving force that developed guidelines and test protocols for the use of water mist on ships. NFPA, UL, FM, CEN have developed guidelines and test protocols for land-based applications, but there are still gaps to close. It is currently the major task of the IWMA to support the further development of a European Standard for water mist systems.

The revision process of Technical Specification 14972 is not finished yet, so has not yet been transformed into a European Standard. This transformation, however, is urgently needed to serve the market with mandatory rules all market players can rely on. Basically, this missing standard currently prevents water mist technology from further spreading throughout Europe. Potential users are hesitant because of the lack of a binding document.

As IWMA had proposed, the first step should be the finishing of the general design and installation standard. The second task should be to add step-by-step test protocols for certain applications.

IWMA Conference 2012

This topic will be certainly discussed in depth during the next IWMA conference in the World Trade Centre in Barcelona on 14th and 15th November.

Many experts and researchers from around the world will present the latest findings on water mist technology, will define the current state-of-the-art of this fire protection technique and will, using case studies, describe the latest applications. The current situation on standards and test protocols will also be discussed. The conference language will be English and Spanish, so Spanish-speaking delegates may take advantage of the English-Spanish translation.

This will be a truly international event; delegates from more than twenty countries will make it once more a worldwide come together. Save the date and join this excellent networking opportunity to meet all major researchers, manufacturers, distributors and others interested in the field. Meet the number-one experts in water mist technology from around the world at the World Trade Centre Barcelona; a very special conference location where you might even get the chance to see a cruise liner equipped with a water mist system just few steps away from the conference centre. APF

For more information, go to
www.iwma.net

New Structural Fire Fighting Helmet Standard

Following eight years of committee deliberation and public comment, the latest edition of the Australia/New Zealand Structural Fire Fighting Standard, AS/NZS 4067: 2012, is now up and running. This new edition will incorporate the introduction of increased minimum requirements for structural fire fighting helmets in Australia and New Zealand.

The SF049 committee responsible for drafting this Standard comprised representatives from numerous Australian and New Zealand fire brigades, the Australasian Fire and Emergency Service Authorities Council (AFAC), New Zealand's United Fire Brigades Association (UFBA) representatives, and industry specialists with international standards experience. While the focus of the new edition remains on providing the highest levels of safety, it also adds three new requirements, and three changes to existing requirements.

New Requirements

1. Helmet shock impact resistance: impact energy transferred must be less than 15kN of all five test sites.
2. Mechanical rigidity (lateral shell crushing test), both transverse and longitudinal.
3. Contact with liquid chemicals on face shield that comprises acid, alkaline, alcohol and organic solvent.

Changes to Existing Requirements

1. The face shield ballistic test speed has been increased from 76 metres per second to 120 metres per second to be in line with EN443.
2. Ease of ignition on ear and neck protector. This has been revised to ISO 15025 method – procedure A, surface ignition, and procedure B, bottom-edge ignition, to be in line with international practices.
3. Revised peripheral vision involving a change of clearance from ≥120° to ≥105°.

Advantages of the Multiple Certification Approach

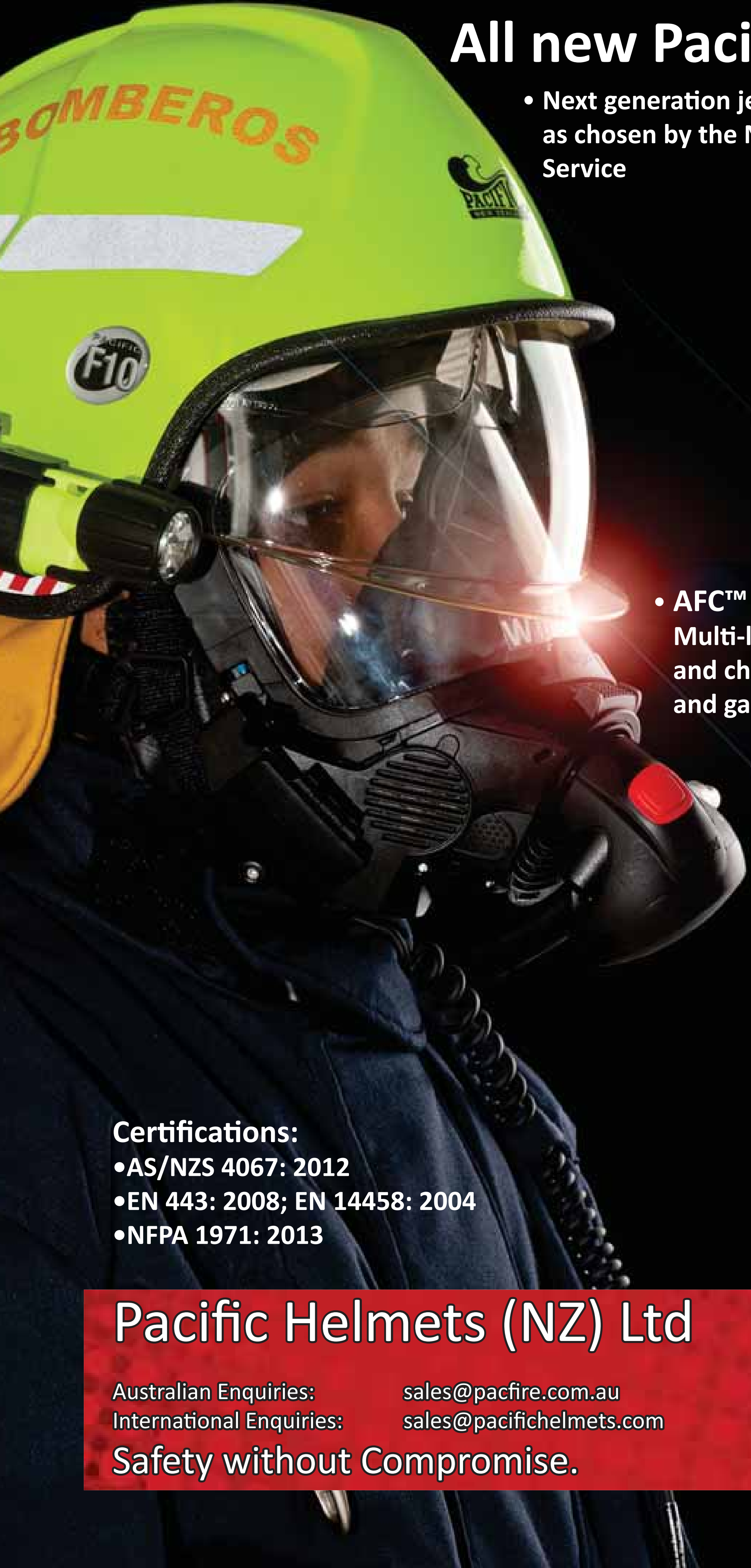
These changes make the AS/NZS 4067 Standard one of the toughest helmet standards in the world today. Currently, Pacific Helmets is the only helmet manufacturer that makes helmets that are certified to all three major international structural firefighting helmet standards (AS/NZS, EN and NFPA). Consequently, conforming to these changes presents no difficulties for the company as its current helmets fall well inside the requirements of any standard and we welcome changes that bring increased safety to the wearers of our helmets.

The key advantage of achieving certification to multiple standards lies in the varied nature of the standards requirements across the three regions. Some tests that are specific to one region may be intended to simulate a particular situation. As an example, the impact energy attenuation test found in AS/NZS 4067 simulates a firefighter falling from height. It also simulates the somewhat neglected but highly significant danger of impact that may result when involved in an accident in an emergency services vehicle.

Helmets Certified to AS/NZS4067: 2012

Pacific Helmets will be both updating existing models and launching new models to the new edition of the Standard. The latest model to be released that will be certified to AS/NZS 4067: 2012 is the F10 Mk III that will also be known as the "Battler". This is a jet-style helmet that features Pacific Helmet's patented One-Touch™ automatic deploying eye protector. Also available in this model is the option of an ultra-high temperature resistant face shield. The company's popular F3D and F4C models will also be certified to the updated edition of the Standard. A version of the high temperature face shield will also be available on these models. The One-Touch™ eye protector will also be incorporated into these two models in the coming months. APF

For more information, go to www.pacifichelmets.com



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Certifications:
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- EN 443: 2008; EN 14458: 2004
- NFPA 1971: 2013

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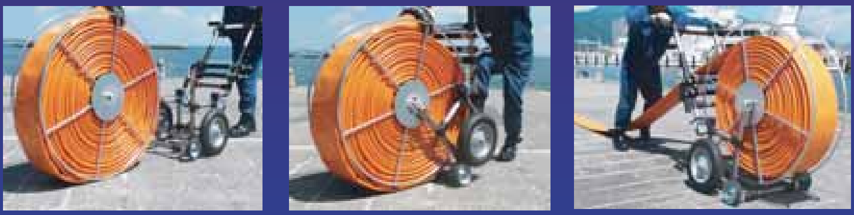
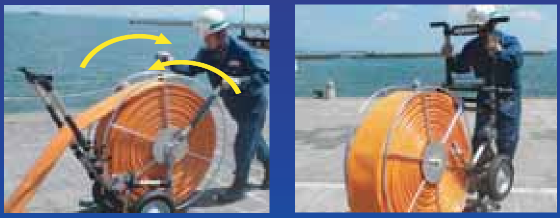
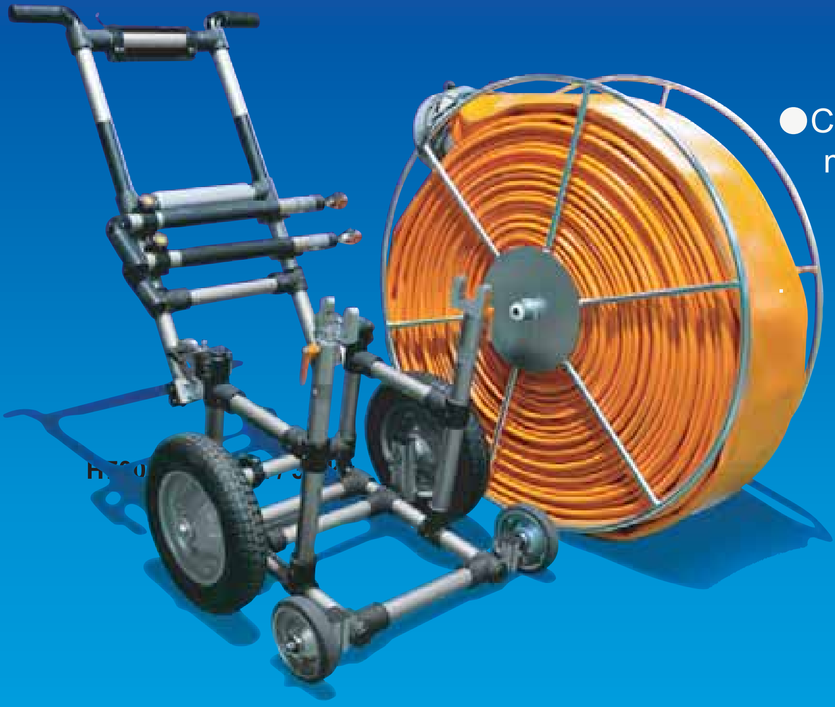


Easy to load, carry, and extend LDH.



Roll up by Ratchet Handle and unload.

Storage into box
by Roller Base



- Carrier's lightweight and compactness make it easier to transport, load, unload LDH and load the carrier onto truck easily.
- Ratchet-type handle lever helps to roll up LDH so easily.

Model	dia (mm)	Max length
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LH-150	125-150	40m
LH-200	150-250	30m
LH-300	250-300	20m

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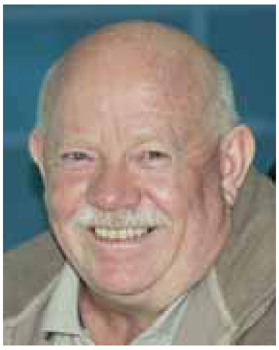
Supporting the Team for a Safe Rescue



Bob Grieve

Delta Fire Australasia

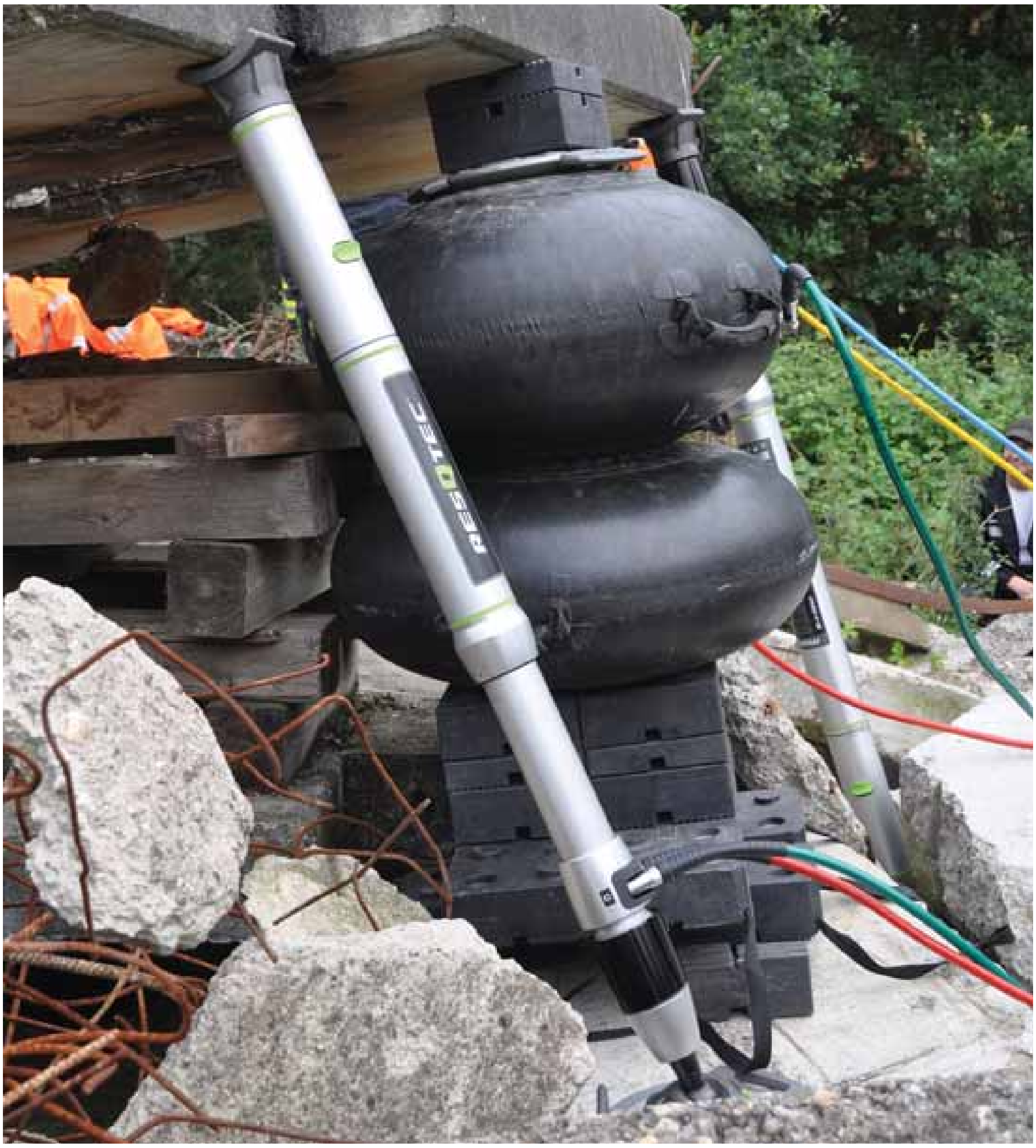
The scale and complexity of natural disasters and man-made incidents, coupled with the population's growing expectation of swift and safe extrication, has in recent years witnessed major strides in the provision of structural collapse and confined space rescue equipment.

All too often our TV screens are filled with chaotic images of frightened and panic-stricken people tearing with their bare hands at collapsed rubble, frantically trying to rescue the victims of buildings, tunnels and bridges demolished by earthquakes, volcanic eruptions and cyclones. Sometimes these scenes are even more harrowing following terrorist activity when the devastation is the result of man's own merciless inhumanity.

Speed of extrication is a key life-saving issue; the faster medical aid can be given to injured victims, the better their chances of survival. It may also be the case that the trapped victim is at additional risk due to oxygen depletion, a fractured water main or gas main or toxic emissions.

So, the equation is simple – the sooner the victims are rescued, the more lives are likely to be saved. However, speed alone is not the only life or death deciding factor. The extrication must be conducted with extreme care if the very endeavour to rescue a trapped victim is not to result in further injury or place the rescuers in even greater peril. To revert back to those scenes on television, it is possible to only speculate how many trapped victims perish as a result of wholly well-intentioned but misguided rescuers trampling over the rubble in their evident distress, further compressing the tonnes of rubble onto those entombed below. One of the major threats to those trapped in collapsed and confined spaces is secondary injury brought about by movement and the dislodging of rubble during the rescue operation.

Training is, of course, absolutely essential to ensure that panic and the risk of further injury to trapped victims and rescue personnel alike are replaced with understanding, expertise, planned response and control of the scene. But to achieve this it is equally important to have at hand the right equipment for the particular rescue challenge being faced – tools such as hydraulic extrication equipment, personal safety and support equipment,



emergency ventilation equipment and, most importantly, tools such as lifting and stabilisation equipment.

Safe Lifting

Lifting a heavy object such as a large section of collapsed masonry or a concrete or steel beam either to free a trapped victim or gain access to a casualty invariably has to take place in very restricted spaces. While the weight of the object to be lifted frequently demands ultra-high capacity equipment, the limited available space through which it can be accessed and in which it can be utilised means that the chosen equipment must also be sturdy, compact and be man-handled and positioned as easily as possible.

Lifting bags used in conjunction with stabilisation blocks are often the only workable option for structural collapse and confined space rescue operations. They have a large stroke, the essential load lifting capacity and can be deployed quickly; they also offer the ultimate in control.

In many collapse situations it is essential that the lifting bag has the ability to raise a point load without any loss of capacity. This is achievable with, for example, the RESQTEC NT-Series lifting bag due to the availability of a connectable load plate. The oval design retains a large surface area, the metal top provides a large contact area throughout the lift, plus bags can be stacked to increase height. Additionally they require no blocking and can cope with an "arc" movement using a pivot point. They are available in three variants: light, medium and heavy duty and, when compared with the high pressure pillow bags on the market, provide as much as 800 percent more power at full height.

Another factor in this particular bag's favour is that, in addition to a safety factor of more than four, it is resistant to puncturing. This is an important consideration as exposed reinforcement bar and broken edges of bricks and concrete sections are a frequently present hazard with which to contend.

Conventional lifting bags are an option that are sometimes considered, but these have certain drawbacks, including an inability to provide an "arc" lift. This is often an important consideration when selecting a lifting system as reliance on just vertical lifting can result in an unstable and dangerous floating load, putting both the victim and rescuer at serious risk of injury if the load topples over during extrication. They do however have a

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role to play when lifting lighter obstructions or when there is a need to form a small gap, for example to release a trapped limb.

Secure Stabilisation

In the vast majority of instances, the use of some form of shoring is absolutely essential, as it is invariably extremely difficult, even for a qualified structural engineer, to judge how an unstable structure is likely to perform when large sections of the structure are moved to access a trapped casualty. To prevent movement of the supported structure while extricating a victim it is vital to effectively crib and securely stabilise the structure. This is best achieved in one of three possible ways: by using stabilisation blocks in conjunction with appropriate lifting bags; utilising support props; or, as is most frequently the best option, implementing a solution that is a combination of both stabilising blocks and support struts.

A widely adopted option is the use of Cribblock interlocking stabilisation blocks. However, it is important when selecting such a stabilisation system to ensure that it offers the essential support integrity, load capacity and modular flexibility to enable it to be used in a myriad of shape and size spaces – confined spaces within collapsed buildings are never flat surfaces at right angles to each other. The Cribblock system, for example, incorporates interlocking devices that ensure that blocks are secured in position and cannot slip apart when under load in the way in which wooden wedges can dislodge. The larger of

the blocks measure 60cm by 20cm by 8cm and weigh 7.5kg; they have integral carrying handles making them easier and quicker to carry, locate and secure in position. Blocks come in a variety of shapes and sizes to offer the greatest in-use flexibility: rectangular blocks, wedges and saddle wedges, together with connectors.

While props tend to be most widely used in road traffic accidents and for vehicle stabilisation, they do have a useful function to perform in supporting building structures and shoring and supporting walls that are at risk of collapsing.

The Profix PX-Series from RESQTEC is a good example of a supporting and stabilisation prop system. It comes in an extensive range of sizes – from 55cm to 373cm – and load capacities spanning from 9.6 tons (94.4kN) to 10.5 tons (102.9kN) with a 2:1 safety factor. Profix PX is available with a number of head attachments to ensure a good grip on concrete or support a beam, plus a three-strut gantry for enhanced load capacity. The extending cylinder can be operated manually or pneumatically in combination with the NT lifting bag described earlier.

These load capacities are increased to 14 tons (139kN) with a 4:1 safety factor in the Profix Max Series air strut, while the sizes span from 60cm to 400cm. A number of extension pieces are available to increase these lengths; it incorporates a quick-fit pull-and-place automatic locking device and one or more struts can be safely operated remotely.

Controlled Procedure

Following the correct procedure is every bit as important as the quality and versatility of the equipment if the rescue is to be carried out swiftly and safely.

While every rescue is unique, there are essentially eight steps that should be taken in the following order when using the equipment described briefly earlier:

- Pivot points should be blocked and crib blocks should be placed on the lifting edge of the obstruction.
- The obstruction should be stabilised using shoring props.
- Hoses, the controller and regulator for the lifting bags should be set up.
- Lifting bags should be connected for the required lift height and capacity.
- Position the lifting bags.
- The rescue team should be coordinated to raise the obstruction.
- Crib blocks should be added as the lift proceeds on a "follow the load" principle.
- The elevated obstruction should then be secured with crib blocks and props, prior to commencing extrication.

This underpins the ever-present need for training and for undertaking regular exercises in conditions that are as near as possible to those likely to be experienced in a real rescue. Teamwork is, of course, absolutely vital, and no amount of the best available equipment will turn a poorly trained, inexperienced crew into an effective structural collapse or confined space rescue team. **APF**

Bob Grieve is Managing Director of Delta Fire Australasia

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Combating Heat Stress on the Frontline

Tom Hainsworth

Hainsworth

Significant advances have been made not only in the personal protective equipment (PPE) used by firefighters around the world but also in terms of the thinking that goes into today's turnout gear. While there was a time, not too long ago, when the only real consideration was thermal protection, the issue of heat stress management is now increasingly regarded as just as important.

Growing awareness of the problem – considered to be the biggest threat to the safety of firefighters – can be seen in the introduction of various standards in recent years. These include the incorporation of water vapour resistance testing into EN469:2005, the introduction of a physiological Annex F into the latest revision of EN469 and the development of the sweating articulated manikin test method ISO 15831:2004.

Total heat loss requirements were introduced into NFPA 1971 in 2000 with the level of stringency being stepped up five years ago from 130W/m^2 to 205W/m^2. A further nod to the importance of heat stress management could be seen with the changing of NFPA 1584 *Recommended Practice on the Rehabilitation of Members Operating at Incident Scene Operations and Training Exercises,* 2003 edition to a standard in 2008 to provide guidance for job specific, safe working procedures for the prevention of heat related disorders.

Heat stress, if not managed and monitored effectively, can not only imperil the life of a firefighter but, on a more day to day basis, can seriously harm someone's decision-making ability which, in turn, then potentially puts the lives of colleagues on the line.

To understand why the issue of heat stress is so important, there is a need to appreciate how the human body reacts to heat. The body's internal core temperature is closely regulated and remains within a very tightly defined range from approximately 36°C to 38°C. This temperature range is maintained by controlling the equilibrium between the amount of heat the body produces through physical activity, the amount of heat stored by the body, and the amount of heat lost to the surroundings through sweat evaporation and heat radiation, convection and conduction aided by vasodilation (the widening of blood vessels that results from relaxation of the muscular walls of the vessels).

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When the ambient temperature of the surroundings rises to above 35°C, heat loss through radiation, convection and conduction stops and the only way left for the body to cool itself is through sweat evaporation. This will also stop if the heat and humidity becomes excessive, causing the body to store the excess heat produced and produce a rise in the core body temperature.

The first symptoms of heat stress are thirst and muscle cramps caused by dehydration. Dehydration levels as low as 2% of body weight can cause slower reaction times and loss of concentration, both of which can put a firefighter in great danger. Ensuring that the firefighter is well hydrated can mitigate the effects of heat stress and dehydration is easier to prevent than treat.

If the core body temperature continues to rise, it can lead to heat exhaustion (symptoms of which include fatigue, dizziness and nausea) and finally heat stroke (core body temperature in excess of 40°C), symptoms of which include seizures, unconsciousness and, potentially, death. A serious side effect throughout this process is mental confusion and irrational behaviour, which can affect the decision making process of the individual and pose a high risk to the wellbeing and safety not only of that individual, but also of all members of his or her team.

Managing heat stress is as much about protecting physical health as it is about protecting mental health and the decision making capability of the individual and the team at large.

There are a number of factors which play a key role in the management and elimination of heat stress. Two of the most important are enhanced personal and operational discipline. The former includes the maintenance and monitoring of fitness and hydration levels, good diet and avoidance of alcohol and caffeine prior to being on duty. The latter concerns crew rotation, rest and recuperation, active cooling and regular employee health checks.

Increasingly, those responsible for the procurement of PPE are looking for a holistic approach from companies such as Hainsworth, which designs its fabrics with a complete understanding of how they interact with the various layers in the system. Serious consideration is given to each layer to offer the best possible performance, which encourages effective moisture movement through the system and, with it, the best possible heat stress management.

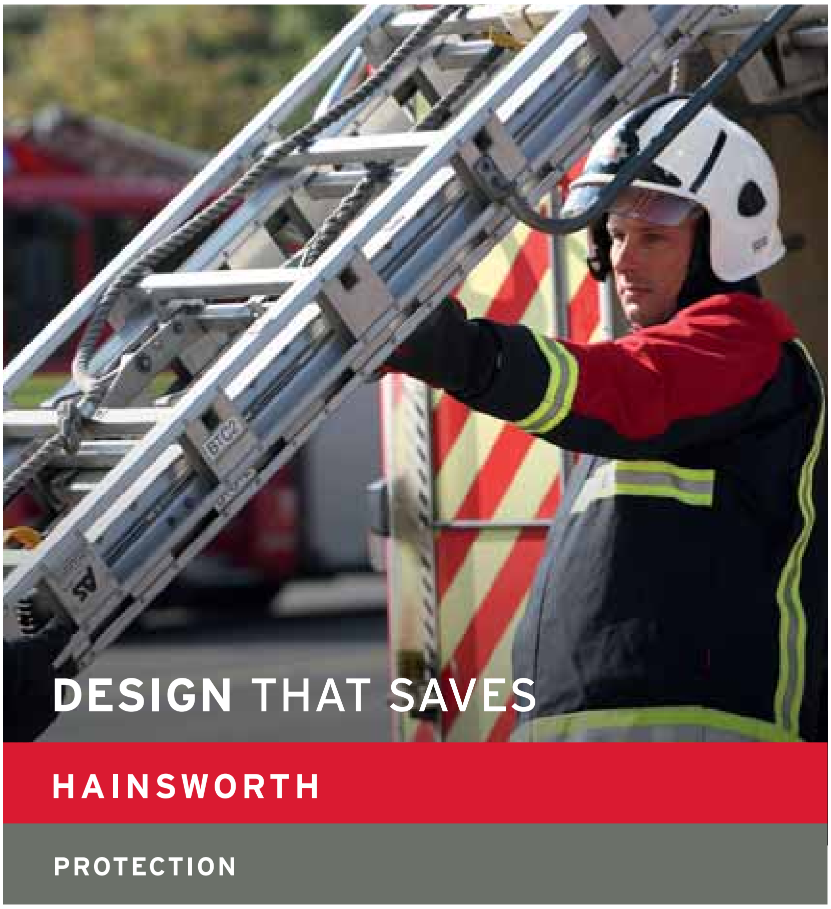
In these tough financial times, there is also an acute awareness that by managing heat stress effectively, there is a significant financial saving to be made in terms of loss of productivity caused by ill health and down days. Mark Jones, one of the UK's most experienced chief fire officers, says: "The importance of heat stress management is now widely recognised and it is a subject in which we are also more knowledgeable and technically efficient than we have ever been. He continues: "Today's firefighters are far more educated about the personal and operational issues surrounding heat stress management and, through their growing knowledge of equipment used by other services, about the PPE available on the market."

"We work with our fire crews to help them understand the issues of heat stress and how they can avoid or mitigate the symptoms. For example, we talk a lot about the importance of personal hydration and of opening their tunics to enhance breathability and accelerate cooling during recovery periods. Our firefighters may be better protected than ever before with today's PPE, which is of a far higher specification, but it important that their awareness and knowledge of the dangers they face remain high." Mark concludes: "In an ideal world, someone would develop PPE with a single directional flow of heat or kit that is totally heat resistant, but this is unlikely to be viable."

The nature of the job means that, when firefighting, firefighters are already operating in a far more stressful environment than virtually every other occupation. By continuing to make advances in heat stress management technology, we can not only help them continue to perform to the highest possible standards operationally but also save lives. **APF**

Tom Hainsworth is Managing Director of Hainsworth

For further information, go to www.hainsworth.co.uk



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Opening Up the Debate on Fire Detection Protocols

Paul Pope

Apollo Detectors

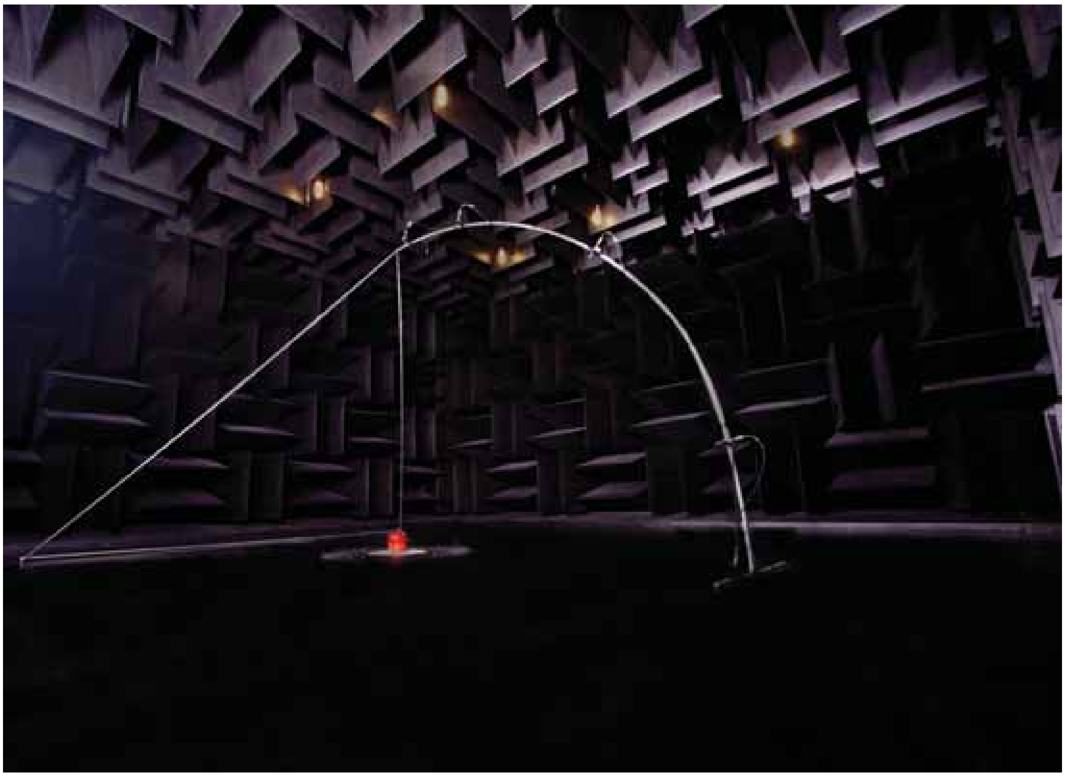
Every year we see more unique buildings appear across the region, each one demanding the highest level of fire protection. At the same time detection technology is moving on a pace with new intelligent systems delivering exceptional service. But, despite all of this, the industry still seems to be dragging its heels on one particular issue – protocol.

You can understand how for many companies producing 'one-stop shop' ranges makes perfect business sense, but in an industry that is supposed to pride itself in doing its upmost to protect life and property how can restricting choice be a good thing? Surely, giving installers freedom of choice when it comes to choosing fire detection systems is the only way forward for the industry.

Protocol is not complicated but some do their best to make it seem so. What it really boils down to is choice and whether you have any.

Protocol is the language devices use to communicate with each other. In the case of fire alarm systems, this usually means the field devices such as manual call points, detectors and interfaces communicating with the fire control panel. Modern fire detection systems constantly monitor the air and temperature around each smoke or heat detector, gathering information that is processed in the detectors and control panels to decide whether a fire is developing. Protocol is the way in which the control panels request and receive this information from detectors in order to ensure that abnormally high levels of smoke or heat are reported without delay. Fairly straight forward so far, but difficulties start to arise when installers may want to use a mix of panels and detectors from different suppliers. Depending on the protocol used, this may not be feasible.

Today's end users of fire detection systems face an increasingly diverse and often complex choice



of solutions, so it has never been more critical that everyone involved in the purchasing decision understands the difference between the two types of system and the potential implications of this decision in years to come.

Closed Protocol

Manufacturers offering both panels and field devices – effectively all the elements needed to provide an intelligent system – have no need to disclose the nature of their protocol to any other parties and as such, equipment supplied by other manufacturers is not expected to be compatible with these systems. The protocol used is said to be 'closed'.

Manufacturers of equipment using closed protocols claim that all elements of their equipment (control panels, detectors, panels, call points, interfaces and special detectors such as beam detectors) will work harmoniously with each other, since it is all designed and made by the same company. The implication is that a system comprising detectors and interfaces from one manufacturer and control panels from another cannot work as well together as when everything comes from one manufacturer.

Those promoting closed protocol would argue that by sourcing products from a 'one-stop shop', the purchasing process is simplified, with customers potentially able to make cost savings and having greater negotiating power because they are placing a single large order with one supplier. In today's economic climate, it is easy to see why companies will take a short-term view to their purchasing decision and be lured into this attractive, cost-saving option.

It is vital, however, that those responsible for purchasing a fire detection system understand that by specifying closed protocol systems, they will be tied to a single manufacturer throughout the lifetime of the fire system. Consideration needs to be given to who will have the negotiating power when the system needs to be extended. Similarly, if the products or services fail to meet expectations, the customer or engineer is not at liberty to try another manufacturer's detectors as a means of eliminating the problem because they will not be compatible with the rest of the system.

Compatibility is without doubt the fundamental problem with closed protocol systems. There is no compatibility between equipment produced by different manufacturers; this restricts the system, resulting in only the original manufacturer or its agents being able to maintain it, and customers being entirely dependent on one supplier for spares, servicing, modification and upgrades of their systems.

It is also important to consider the longer-term implications of opting for a closed protocol system – when an upgrade or extension to the system is required in the future, customers will have only a limited choice and it cannot be assumed that products from the original closed protocol will still be available. In this situation, the cost of upgrading or extending will drastically increase as the only option is to replace the entire fire system and start again.

Open Protocol

A number of device manufacturers, including Apollo Fire Detectors, do not make all the fire system components themselves and have instead built up partnerships with independent fire control panel manufacturers and, in some cases, companies that offer other synergistic products, such as aspirating smoke detectors. It is the field device manufacturer that normally determines the protocol used. In order to encourage independent manufacturers to design and develop control panels that are fully compatible, they publish and share information including technical data, enabling panel manufacturers and other companies to design compatible controlling equipment.

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As all the details of the protocol are disclosed to associated partners, it is referred to as an 'open' protocol.

An open protocol system avoids many of the potential pitfalls of being tied to a single manufacturer. The benefits offered by open protocol systems include:

- Choice – An open protocol system makes products interchangeable across a wide range of manufacturers and offers freedom of choice in terms of product, installer and maintainer. The customer is free to choose between different companies to service the system.
- Expertise – Different suppliers could be used for the components according to their specific area of expertise. Open protocol manufacturers can concentrate their core specialist skills and maintain flexibility in an integrated systems approach.
- No Restrictions – Upgrades, maintenance or replacement of products can be undertaken by any competent installer.
- Availability – Compatible products are available from a greater range of suppliers.
- Competition – Multiple providers create greater price competition and drive providers to keep customers because they give the best value and service.
- Innovation – Open protocol offers customers greater choice as it drives manufacturers to innovate and create better products that people select because of their performance.

One criticism sometimes directed at open protocol is that combining products from different manufacturers inevitably means that the system will not work as well as one where all the components are sourced from a single manufacturer. However, this is a false assumption as the certification and testing for all the components of the fire detection system remains the same.

To use a sporting analogy, most Formula 1 racing cars are a combination of components from various specialist high technology manufacturers and are extremely successful. In this highly competitive sport it is an advantage to use the best in-class specialist manufacturers that can concentrate on their own skill areas. This is also true in the fire detection industry.

Basing fire system development on partnering rather than excluding other manufacturers encourages longevity. Manufacturers may come in or occasionally drop out of the partnership, but products compatible with the shared, open protocol will always remain. The digital protocol that Apollo detectors use, for example, has been available since 1980, and has since been extended twice to ensure that Apollo technology is always the latest and most up to date in the industry. Although the protocol has been extended, it still ensures forwards and backwards compatibility between products, simplifying extensions of systems or replacement of detectors to accommodate changes of building use and making upgrades logistically easier because work can be carried out in phases over time.

A criticism sometimes directed at open protocol is that combining products from different manufacturers inevitably means that the system will not work as well as one where all the components are sourced from a single manufacturer. This is a false assumption as the certification and testing for all the components of the fire detection system remains the same.

Key Considerations

There are pros and cons for both closed and open protocol and the decision as to which type of fire detection system to be installed needs to be made on a case-by-case basis. There are, however, some key questions that should be asked and the following checklist is a useful starting point when beginning the process of purchasing a new fire detection system, whether open or closed protocol:

- Is the manufacturer a well-established company?
- What after-sales service is offered by the manufacturer?
- How long will the product range be supported?
- What is the manufacturer's upgrade policy?
- Will the manufacturer maintain product backwards and forwards compatibility?
- Can the system maintenance be carried out by any competent third party? If yes, what knowledge, protocols, equipment, software passwords etc are required?
- What is the cost of maintenance for the life of the system?
- What is the cost of replacement parts (such as detectors) for the life of the system?
- What are the labour rates for service and call outs and the rates for software upgrades?

Conclusion

The objective of this checklist is to make decision makers consider the total cost of ownership (TCO) rather than just the purchase price when making a financial comparison between fire detection systems.

The TCO includes all of the additional costs required to support and maintain the system purchased for its lifetime. The protocol of a fire detection system must be considered at the purchasing stage in order to help determine the total lifetime costs. Even where one option seems to offer an initial cost saving, it is the whole life cost of the fire system – and how easy it will be to maintain to a standard that meets both current and future requirements – that must be the priority of the fire safety professional.

Apollo acknowledges the importance of life safety and system integrity and recommends the routine replacement of detectors after ten years. Apollo's Product Lifetime Guarantee supports the recommended working life of a detector and provides a warranty on all products, which for detectors is ten years and for CO detectors is five years. APF

Paul Pope is Business Innovation Manager at Apollo Detectors

For further information, go to www.apollo-fire.co.uk

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Typical ICAO Level B performance of tested F3s at one-minute

Independent Evaluation of Fluorine Free Foams (F3)

A Summary of ICAO Level B & EN 1568 Fire Test Results

Mitch Hubert

Chang Jho

Eduard K. Kleiner

Dynax Corporation

Dynax Corporation is a major producer of C6-telomer-based fluorosurfactants and fluorochemical foam stabilisers for use in AFFF, AR-AFFF, FP, FFFP and AR-FFFP agents, and a founding member of the Fire Fighting Foam Coalition (FFFC). In the past, Dynax has received from customers and other sources conflicting information regarding the fire performance levels of Fluorine Free Foam (F3) agents, particularly against the ICAO Level B foam standard. Despite individual attempts by some foam manufacturers in the past, F3 agents have rarely been subjected to an independent and comparative evaluation under the same test conditions.

As a member of the Fire Fighting Foam Coalition (FFFC) Dynax is involved in the evaluation of the proposed ICAO Level C standard that has recently raised some serious issues, such as extending the extinguishment time requirements by permitting flicker fires from 60 seconds to 120 seconds. If adopted, this change of extinguishment time requirements would also apply to the existing ICAO Level A and B standards.

In an effort to obtain independent and comparative fire performance data on F3 agents under the same test conditions, Dynax, as the sponsor of this project, commissioned Resource Protection International (RPI) to provide an independent third-party witnessing service for the fire tests according to ICAO Level B and EN 1568 (Part 3 and 4). RPI is uniquely qualified to witness such tests as it has sitting members on the NFPA and EN Foam Technical Committees, as well as being LASTFIRE testing coordinators and LASTFIRE steering committee members. Dafo Fomtec and Falk Nutec provided logistical support. The test data presented in this article is taken directly from the full report prepared by RPI.

TABLE 1 – ICAO LEVEL B TEST RESULTS

Test Configuration: ICAO Level B
Test Fuel: Jet A1 / **Premix: in Fresh water**

Test Product	Nozzle	FXR	QDT	CT (90%)	CT (99%)	EXT	BB (25%)	Pass/Fail
Product A-F3-6%	UNI 86	9.6	18:26	0:35	0:45	None	N/A	Fail
	MMS	4.8	10:56	0:30	0:45	1:58	(6:45)	Fail
Product B-F3-3%/6%	UNI 86	10.2	15:07	0:40	0:45	1:24	(7:50)	Fail
	MMS	4.9	5:35	0:35	0:55	None	N/A	Fail
Product C-F3-3%	UNI 86	9.6	16:16	0:50	1:05	2:00	(8:30)	Fail
	MMS	4.5	18:38	0:50	1:45	None	N/A	Fail
Product D-F3-3%/3%	UNI 86	8.5	22:57	0:55	1:05	1:40	(9:50)	Fail
Product E-F3-3%/6%	UNI 86	7.4	17:00	0:40	0:55	1:50	(8:05)	Fail

MMS (Modified Militatry Specification); FXR (Foam Expansion Ratio); QDT (Quarter Drain Time); CT (Control Time); EXT (Extinguishment Time); BB (Burnback Time)

TABLE 2 – EN 1568-3 TEST RESULTS (FORCEFUL APPLICATION)

Test Configuration: EN 1568-3 / FORCEFUL Application
Test Fuel: Heptane / **Premix: in Fresh water**

Test Product	Nozzle	FXR	QDT	CT (90%)	CT (99%)	EXT	BB (25%)	Class
Product A-F3-6%	UNI 86	9.3	25:16	0:45	1:25	None	N/A	Fail
	UNI 86	8.8	18:25	0:25	1:00	None	N/A	Fail
	MMS	4.6	10:25	0:45	1:20	None	N/A	Fail
	MMS	5.0	9:33	0:40	2:50	None	N/A	Fail
Product B-F3-3%/6%	UNI 86	9.3	16:57	0:50	1:10	None	N/A	Fail
	MMS	4.5	6:04	0:55	DNA	None	N/A	Fail
Product C-F3-3%	UNI 86	8.5	21:32	0:45	1:20	1:49	6:00	→
	MMS	4.2	18:28	0:40	3:00	None	N/A	→
Product D-F3-3%/3%	UNI 86	8.7	19:11	0:40	1:15	2:09	5:55	→
	MMS	5.1	15:34	0:50	DNA	None	N/A	→

MMS (Modified Militatry Specification); FXR (Foam Expansion Ratio); QDT (Quarter Drain Time); CT (Control Time); EXT (Extinguishment Time); BB (Burnback Time); DNA (Did Not Achieve); → (Followed by Gentle application test)

TABLE 3 – EN 1568-3 TEST RESULTS (GENTLE APPLICATION)

Test Configuration: EN 1568-3 / GENTLE Application
Test Fuel: Heptane / **Premix: in Fresh water**

Test Product	Nozzle	FXR	QDT	CT (90%)	CT (99%)	EXT	BB (25%)	Class
Product A-F3-6%	UNI 86	9.3	25:16	0:35	1:00	None	N/A	Fail
	UNI 86	8.8	18:25	0:35	1:00	None	N/A	Fail
	MMS	4.6	10:25	1:00	1:40	None	N/A	Fail
	MMS	5.0	9:33	0:55	1:15	3:40	13:00	IIIC
Product B-F3-3%/6%	UNI 86	9.3	16:57	0:40	1:20	None	N/A	Fail
	MMS	4.5	6:04	1:00	1:45	None	N/A	Fail
Product C-F3-3%	UNI 86	8.5	21:32	0:35	1:20	2:17	24:30	IB
	MMS	4.2	18:28	0:45	1:55	4:05	23:30	IIIB
Product D-F3-3%/3%	UNI 86	8.7	19:11	0:35	1:05	1:40	21:50	IB
	MMS	5.1	15:34	0:45	1:30	2:50	12:45	IIIC
Product E-F3-3%/6%	UNI 86	8.7	18:04	0:45	1:25	2:08	17:00	IIIB
	MMS	4.4	5:58	1:25	2:10	None	(10:40)	Fail

MMS (Modified Militatry Specification); FXR (Foam Expansion Ratio); QDT (Quarter Drain Time); CT (Control Time); EXT (Extinguishment Time); BB (Burnback Time);

ICAO Level B & EN 1568 Fire Test Program

In May of 2012, a series of 38 fire tests were carried out with five different Fluorine Free Foam (F3) agents by the Danish Fire Laboratories (DFL) at the outdoor fire testing and training facilities of Falk Nutec in Esbjerg, Denmark. ICAO Level B and EN 1568 tests were conducted in fresh water. Although the ICAO Level B Standard allows nozzle movement in a horizontal plane during the test, all tests in this program were run with the nozzle in a fixed position to improve the reproducibility in comparing the performance of the F3 agents.

The main objectives of this extensive fire test program were to:

- Confirm if the selected group of F3 agents meet, under the same test conditions, the requirements of ICAO Level B and EN 1568 (Part 3 and 4).
- Compare the above test results obtained with the UNI 86 nozzle (the nozzle specified in ICAO and EN 1568 Parts 3&4) with results obtained with a modified air-aspirating US Mil-Spec (MMS) nozzle providing the same nominal flow rate as the UNI 86 nozzle but approximately half the foam expansion and drain time values. The results of these comparative fire tests are considered important, because many commercial air-aspirating foam discharge devices, such as hand-line nozzles, branch-pipes and high flow turrets, generate foams with considerably lower expansion and drain time characteristics than those obtained with the UNI 86 nozzle.
- Determine if all the F3 agents included in this study are free of fluorine.

Test Samples

With one exception, the test samples were all commercial products purchased on the open market just prior to the test program. These products represent sampling of the major F3 agents currently available on the market. The F3 agents tested are coded as follows:

- Product A-F3-6%.
- Product B-F3-3%/6%.
- Product C-F3-3%.
- Product D-F3-3%/3% (a developmental product).
- Product E-F3-3%/6%

Results

As expected, test results showed variability between manufacturers. In general, the foams tested showed reasonable fire control but suffered persistent edge flicker fires so they failed to extinguish at all, or only extinguished with considerable difficulty.

Of particular interest were the results obtained from the ICAO Level B testing (Table 1), because a few airports and aerodromes have recently started using F3 agents in lieu of AFFF or FFFP agents.

When the nozzle was maintained in a fixed position, these tests showed that none of the F3 agents extinguished the fire within the maximum 60-second time limit specified in the ICAO Standard. Contrary to the expectation that the sloppier foam obtained from the MMS nozzle might provide a faster knockdown and extinguishment on aviation kerosene (Jet A1), control times actually got longer with the MMS nozzle in two out of the three tests, and in both of these cases extinguishment was not achieved.

EN 1568-3 test results summarised in Table 2 and 3 also show variability in performance between agents.

These sets of data have shown that only three of the five agents tested were able to gain an EN 1568-3 class rating. In all cases, the control and extinguishment times extended considerably as the UNI 86 nozzle was switched to the MMS nozzle. It is noted that none of the agents in this test program achieved an IA forceful application rating (Table 2). Even under the gentle application conditions (Table 3), some F3 foams failed to extinguish the fire when the MMS nozzle was used.

For EN 1568-4 testing (Table 4), only the three agents claiming polar solvent performance were tested. Only the developmental F3 agent passed these fire tests using both acetone and isopropyl alcohol (IPA). In general, all F3 agents did quite well on the acetone fire but poorly on the IPA fire.

All of the test results are summarised in Table 5.

TABLE 4 – EN 1568-4 TEST RESULTS

Test Configuration: EN 1568-4 / GENTLE Application
Test Fuel: IPA / Premix: in Fresh water

Test Product	Nozzle	FXR	QDT	CT (90%)	CT (99%)	EXT	BB (25%)	Class
Product B-F3-3%/6%	UNI 86	9.1	45:30	DNA	DNA	40% at 5 min	N/A	Fail
Product D-F3-3%/3%	UNI 86	8.2	19:22	1:25	1:55	2:06	15:15	IA
	MMS	5.0	16:15	1:45	2:10	2:57	15:30	IA
Product E-F3-3%/6%	UNI 86	8.1	44:27	1:50	2:25	3:00	8:45	IC
	MMS	4.9	21:57	DNA	DNA	50% at 5 min	N/A	Fail

Test Fuel: Acetone / Premix: in Fresh water

Test Product	Nozzle	FXR	QDT	CT (90%)	CT (99%)	EXT	BB (25%)	Class
Product B-F3-3%/6%	UNI 86	9.1	45:30	1:15	1:35	2:15	12:15	IB
Product D-F3-3%/3%	UNI 86	8.2	19:22	0:25	0:45	1:04	16:55	IA
Product E-F3-3%/6%	UNI 86	0:30	44:27	0:30	0:45	1:12	19:00	IA

MMS (Modified Militatry Specification); FXR (Foam Expansion Ratio); QDT (Quarter Drain Time); CT (Control Time); EXT (Extinguishment Time); BB (Burnback Time); DNA (Did Not Achieve)

TABLE 5 – SUMMARY OF TEST RESULTS

	Nozzle	ICAO Level B	EN 1568-3		EN 1568-4	
Test Fuel		Jet A1	Heptane		IPA	Acetone
Mode of Application			Forceful	Gentle	Gentle	Gentle
Product A-F3-6%	UNI 86	Fail	Fail	Fail	–	–
	MMS	Fail	Fail	Fail / IIIC	–	–
Product B-F3-3%/6%	UNI 86	Fail	Fail	Fail	Fail	IB
	MMS	Fail	Fail	Fail	–	–
Product C-F3-3%	UNI 86	Fail	➔	IB	–	–
	MMS	Fail	➔	IIIB	–	–
Product D-F3-3%/3%	UNI 86	Fail	➔	IB	IA	IA
	MMS	–	➔	IIIC	IA	–
Product E-F3-3%/6%	UNI 86	Fail	–	IIIB	IC	IA
	MMS	–	–	Fail	–	–

ICAO: Fail – No extnguishment within 1 minute
EN 1568-3 (Forceful): Fail – No extinguishment within 3 minutes
EN 1568-3 (Gentle): Fail – No extinguishment within 5 minutes
EN 1568-4: Fail – No extinguishment within 5 minutes
➔ : Indicates the test was repeated with Gentle Application

Discussion

The F3 agents tested showed differences in fire performance between manufacturers and fuel types. Most agents during this test program suffered from persistent edge flicker fires causing problems meeting the extinguishment requirements. The results of these tests with a higher foam expansion UNI 86 nozzle and a lower foam expansion MMS nozzle show that firefighting effectiveness decreases with the foam quality.

The foam expansion and drain time values from the MMS nozzle are more realistic of the foam quality typically obtainable from real-world air-aspirated discharge devices. This drop-off in performance should be of major concern to any users of F3 agents. Many municipal and industrial fire brigades have switched away from air-aspirated discharge devices in favour of variable pattern non-aspirating nozzles. While these non-aspirating devices work effectively with fluorine-containing foams, the use of such devices with F3 agents seems to be questionable. Likewise, some ARFF vehicles have gone away from air-aspirating turrets and hand-lines in favour of non-aspirating devices in order to achieve greater reach of the foam from the turret and hand-lines and faster knockdown of the fire.

Surprisingly, all of the F3 agents tested failed to pass ICAO Level B performance requirements. A few airports and aerodromes have recently converted away from the conventional fluorine-containing foam agents such as AFFF and FFFP to F3 agents.

The failure of F3 foams to perform under forceful application conditions in both ICAO Level B and EN 1568-3 appears to be related to fuel contamination effects that are expected to be more pronounced under direct, forceful application conditions. Foams generated from the MMS nozzle are heavier and therefore expected to pick up more fuel than the lighter but unrealistic foams produced by the UNI 86 nozzle.

Conclusions

Five F3 agents were independently evaluated and compared under the same test conditions against the fire performance standards of ICAO Level B and EN 1568. In this test program, all failed to meet the ICAO Level B test requirements. Against EN 1568-3, none of the products met the IA class ratings under direct, forceful application conditions; some achieved the ratings only with indirect, gentle applications. Significant deterioration of firefighting performance was observed when the MMS test nozzle was used delivering foams with quality more realistic of widely used foam turrets and hand-lines.

Laboratory analysis of all F3 foams tested confirmed that they are fluorine free. APF

Mitch Hubert is Vice President of Marketing, **Chang Jho** is Vice President of R & D and **Eduard K. Kleiner** is President & CEO of Dynax Corporation

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Popular Style 366 Nozzle delivering protective fog pattern. Photograph courtesy of Protek

Mike Willson

Selecting Hoses and Nozzles

All fire-fighters work in a dangerous environment, but those tackling the flames are most at risk. The fire hose is a vitally important "lifeline" for firefighters, who rely on them to carry out an effective, efficient and above all a safe job.

The chosen fire hoses must be durable, reliable and flexible to deliver water or firefighting foam agents consistently. Nozzles play a key part in delivering more choices to the firefighter in the "hot seat", providing the versatility needed to get the job done swiftly and efficiently. Several fire teams found out `the hard way, that using hoses beyond their design limits can lead to sudden failure – a false economy that has put firefighters' lives suddenly, and unexpectedly, at risk.

Three key factors are critical when choosing fire hoses – abrasion, kinking, and liquid pick-up. Keeping these in mind can help avoid this happening to your fire teams, and understand how they should influence your purchasing decisions. Perhaps use it to check whether your existing hoses are really as trustworthy as you think?

Common Hose Requirements

Let us think about how and where we use our fire hoses; what they need to be doing for us; and then review hose design and materials to see what is likely to deliver those requirements. Whether you are an industrial, municipal, aviation, marine or military firefighter, your fire hoses are likely to:

- Be regularly dragged across and through abrasive materials.
- Come into contact with a range of liquids from water and fuels to more aggressive chemical spillages that can quickly affect or attack unprotected jacket fibres, even in some covered type hoses.
- Be often used in confined spaces and complex layouts including high rise buildings.

The ideal firefighter's hose needs to provide a reliable, consistent water flow even at lower pressures, whenever and wherever the firefighter needs it, reliably time after time. To do this it needs to be particularly durable, flexible and long lasting.

How well do Hoses Stand up to Abrasion?

Dragging hoses weighed down with water through grit, over tarmac, rubble, broken glass and other debris is common place, but the design of your hose will have a significant bearing on how long it will stand up to this rough treatment.

The jacket fibres are vital to containing the water pressure and delivering it effectively to the firefighter's nozzle. Damage here will cause the quickest premature failure. In the USA, alternative "double jacket" hoses are often used to try and overcome this problem. The hose jacket fibres are protected by an extra jacket, designed to be worn away and protect the inner jacket from damage. It can work well, but makes the hose much heavier and harder to use, particularly when both jackets are wet. It also provides little protection from liquid contaminants that can attack or weaken key internal fibres. They also need extra time spent washing and drying after each use, requiring increased stock levels to ensure sufficient hoses are ready for action.

In many countries "canvas" or "double jacket" types have largely been replaced by wipe-dry rubber "covered" type fire hoses. The main exception is bush firefighting, where controlled percolation hoses are still widely used, to intentionally leak a film of water to protect the hose from burning.

The variety of "covered" fire hoses comprise essentially two basic types, each having jacket fibres with internal rubber lining and external rubber cover, to reduce abrasion damage and chemical attack. The answer lies in selecting those that deliver on your stringent requirements. It is all about construction methods and materials used, delivering firefighters the reliability, long term durability, and value for money they need and deserve.

Often heavier and cheaper, are the "sandwich" type construction covered hoses. These are literally glued together in a sandwich of lining, textile jacket and outer cover. In theory this is a good solution, but the rubber mix usually has high levels of PVC that are not as flexible or resistant to abrasion, heat and sunlight as nitrile. Any slight damage to the cover will allow water and contaminant absorption by the jacket fibres, acting like blotting paper. When the hose is next pressurised, this liquid tries to get out, but both impervious outer cover and inner lining force it along the line of least resistance – the glue. These forces can often strip the cover or lining from the jacket in seconds along its whole length, often causing premature failures. The hose becomes suddenly useless, the system must be de-pressurised, the length replaced before continuing, but firefighter safety can be severely compromised.

This sudden and often unpredictable failure, can be avoided by choosing the more resilient "through the weave" type covered hose. As the term suggests, during manufacture the inner lining and outer cover are produced under pressure and squeezed through the jacket weave in a single operation, making it very strong with solid pillars of rubber linking cover to lining through the jacket, without glues. Tiny pinholes made in the cover release volatile gases from the lining during its steam vulcanisation process, to prevent internal blistering and potential lining damage.

Leading brands such as Angus Duraline have developed special nylon textile jacket fibres that flex more easily, accompanied by unique optimised PVC/nitrile rubber formulations. Additional chemical bonding takes place between jacket and rubber during this curing process. Solid plugs of natural latex rubber fill these tiny pin-holes under vacuum to completely seal the hose and provide the levels of flexibility and durability required to protect the firefighter, deliver exceptional firefighting performance and good value for money. Each length is pressure tested to 22.5 bar g. before leaving the factory to ensure its durability, and long life. I have seen these Duraline fire hoses after many years of constant use by municipal fire brigades and industrial fire departments, outperforming other newer covered hoses already giving problems at less than half their age and usage.

How is Kinking Important?

Many firefighters seem to overlook the critical importance of kinking, or lack of it, in their fire hoses. Kinking or folding of fire hoses during use is commonplace, but causes two important things to happen. It can put lives at risk when the kink restricts or ceases water flow to the nozzle operator tackling the fire. The kink also causes a high point on the hose that leads to excessive abrasion at that point when dragged, causing early hose failure.

This can easily happen if hoses become twisted, are moving through confined spaces like doorways, upstairs, in high rise buildings or operating at lower pressures. Kinking also results from dragging unpressurised but partly full hoses, or sudden drops in pump pressure, allowing the hose to relax and cause a kink. This dramatically reduces water flow and increases the risk of bursting. If kinked against an obstacle, the only answer is to find the offending obstruction, wasting valuable time and potentially putting colleagues at risk. Most hoses will kink quite easily at pressures around 5 bar g, but how do you know whether your hoses will kink easily or not?

A Simple Kink Test

You can conduct a simple test, similar to that used by the UK Navy before accepting any fire hose for use on board ships:

1. Lay the hose out in a straight line.
2. Fill a 45 gallon drum with water, and place next to the hose.
3. Bring the hose tight round the drum, in a smooth curve.
4. Connect the hose to a nozzle in the 'off' position, and pressurise the hose to 5 bar.

Are there any kinks? If so, your hose is prone to kinking and could not only cause unnecessary operational problems, but also cause sudden and premature bursting from abrasion at the kink point, placing firefighters at risk.

Many hoses that fail this simple test have cheaper polyester jacket fibres, which do not extend in the same way as nylon's ability to minimise kinking. The best "through the weave" performers are those with special nylon textile yarns that maintain their profile and resist kinking at pressures as low as 3 bar, again such as, Angus Duraline. Such low kinking hoses are best suited for the Cleveland coil stowing method, increasingly used for high rise buildings. This lessens the burden on firefighters working in restricted environments, yet ensures speed of deployment with maximum water flow at the nozzle, delivering both optimum firefighter protection and fire impact.

Increasing numbers of firefighters are recognising that kinking exposes them to unnecessary risks, and causes premature damage reducing hose life. Many are now specifying a kink test, in addition to BS 6391 Kitemark specifications for their hose (the world's best performance fire hose specification) to prolong hose life, increase value for money and increase firefighter safety.

What Else Causes Fire Hoses to Commonly Fail?

The next most important factor is the amount of liquid absorbed into the jacket. Operationally this could be firewater run-off, hydrocarbon fuels, or a variety of industrial chemicals, like polar solvents, acids or alkalis, all of which can attack or weaken the crucial jacket fibres that are retaining and delivering consistent pressurised water flow to the firefighter. "Through the weave" hoses with optimum PVC/nitrile rubber and plugged pinholes are the best answer to reducing liquid ingress to the jacket fibres, and prolonging the safety and life of your fire hose.

There are many other reasons and causes for failure including lining damage causing water to enter the hose, commonly delaminating "sandwich" type hoses; damage from radiant heat and burning embers that can melt and burst the hose, unless adequate levels of nitrile are included in the formulation; attack from sunlight causing deep cracks in the cover where high PVC levels are used.

Which Diameter is Best?

Having selected a "through the weave" fire hose with nylon jacket fibres and high nitrile to PVC content cover and lining to meet your stringent needs, we need to consider the suitable hose diameter and its impact on pressure as we move further away from the water pumping source.

For long distances, 64mm is common for industrial locations, and even larger diameter 125mm or 150mm layflat "through the weave" hoses are being used by many industrial and larger municipal fire departments to help speed up hose deployment and deliver more efficient configurations, particularly where large water or foam flows are needed. Smaller diameters are preferred where only one or two lengths are used from the pumped supply to maximise flexibility, but they will increase the frictional pressure losses. Using a smaller diameter at the end of the hose lay is a good way to gain flexibility while minimising pressure losses.

Increasingly municipal fire departments are looking at smaller diameters of 52mm, 45mm or 38mm at the nozzle to increase manoeuvrability, reduce weight and save water. Smaller diameters make better use of limited water resources and lower pressure availability, particularly in regional and remote areas, where vehicles may be reliant on their water tank for some time, until back-up supplies can be relayed and connected.

Which is the Most Appropriate Nozzle to Choose?

Despite a bewildering array of styles, there are several key factors to consider. Firstly the likely flow rates that can be supplied by the fire pump(s), hose diameters and layout configurations, which need to be calculated and will determine the usable flow range of the nozzle selected and the inlet connection to attach to your fire hoses.

The materials of construction, whether aluminium alloy for drinking water quality, or the more durable corrosion resistant but heavier brass construction, where borehole or salt water is frequently being used, consider a shut-off option, so you can save water while changing your position of attack, or during mopping up. A jet-spray facility helps cover larger areas more quickly and provides some operator protection, while spinning or fixed teeth can vary the spray pattern. Selectable flow variation helps minimise water damage, reduce usage during damping-down duties and increases flexibility for smaller fires.

Past preferences will also inform your decision, but a pistol grip is very popular as it helps control and better direct the water stream from the nozzle. Colour coding of shut-off handles and pistol grips could be useful for larger users with a wide range of nozzles to identify specific roles. A stainless filter mesh at the inlet is also advisable to prevent sudden blockage or damage caused by debris in the water. You may decide that a constant flow rate is necessary irrespective of whether the nozzle is set on straight stream, spray or full fog. Alternatively, if you have fluctuating water flows an automatic nozzle will maintain an effective pressure and consistent stream for the firefighter. A new dual pressure capability allows switching between 5 bar and 7 bar at the nozzle to better control your application.

A Multi-Purpose nozzle may be ideal, providing a solid bore, fog spray or combination of both to meet your requirements. Alternatively a shock-less nozzle that goes to fog first before jet, to reduce the sudden reaction forces could be appropriate, particularly for training rooky firefighters. Many of these nozzle styles are NFPA 1964 compliant or FM approved. Some exceed both criteria like Protek's popular 366.

More Specialised Applications

You may decide a more specialised nozzle is required for your application, perhaps for wild-land, forest firefighting, high pressure use, play-pipes for multi firefighter applications needing high flow rates, flammable liquid control with a foam nozzle, or marine use. You may be looking for an adaptor to make better use of your existing nozzle with a clip-on foam tube, piercing adaptor for inaccessible areas, or dual agent AFFF foam and dry powder nozzle, used separately or together, for controlling pressurised liquid fires.

Selection of the appropriate nozzle and fire hose design will provide your best answer to deliver reliable, fast, efficient and effective fire control, firefighter safety, durability and long life, plus excellent value for money. Keep safe. **APF**

Mike Willson is a Consultant in areas of specialised Fire Protection

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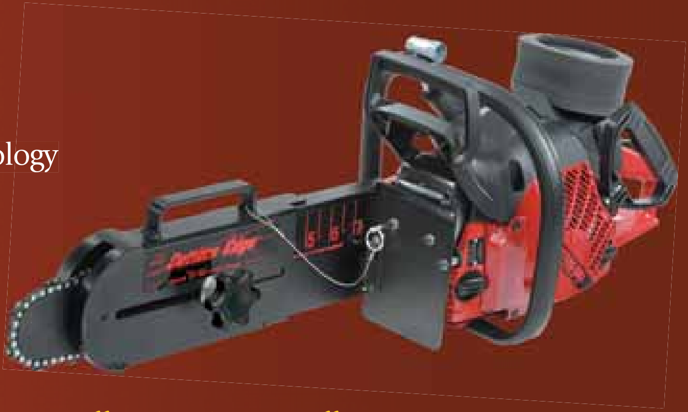

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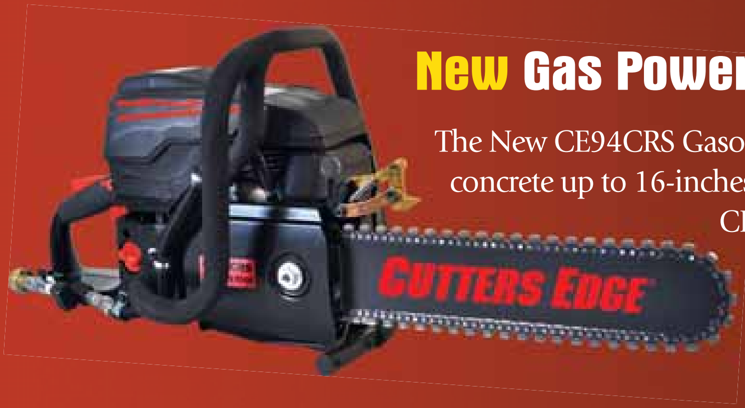

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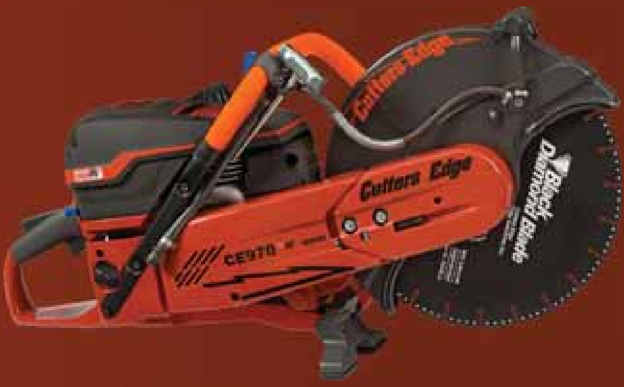

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Building Bushfire Resilience:

Protecting Vulnerable Communities

Gerry Quinn

Aurecon

The 2009 Black Saturday bushfires in Victoria, Australia were a tragic illustration of the vulnerability and risk many communities face in the event of an uncontrolled wildfire occurring on a large scale. Having lived through a natural disaster of such magnitude, the Victorian government, and Victorians themselves, recognised the necessity and urgency of protecting the lives of at-risk communities.

Following Black Saturday, the Victorian Department of Education and Early Childhood Development (DEECD) initiated a substantial and wide ranging review of bushfire and emergency management arrangements. One significant project established by the Department was the School Bushfire Protection Project (SBPP).

Through this project the Department engaged a consortium to manage a site visit and works programme at schools identified as being at high bushfire risk. The primary objective of the project was to improve the bushfire protection of students and staff at schools in high bushfire risk locations in a practical and timely manner. The consortium engaged by the Department included experts in fire risk modelling, threatened species assessments and engineering solutions for bushfire-prone locations. The team were directed by the Department to find solutions that improve safety, reduce bushfire hazards and minimise the impact of bushfire on the school site.

Bushfire Management Plans — Understanding the Need

There have been significant developments in the understanding of bushfire modelling, engineering and incident response planning since the Black Saturday fires, with significant potential for improved planning, prediction and fire protection engineering.

Aurecon, a global engineering, management and specialist technical services business, was chosen to lead this consortium. The project focused on the use of multi-disciplinary teams that included government advisors, botanists, fire engineers (buildings), planners, environmental

Crown scorch adjacent to the playground indicates the flame zone extent

managers, engineers and procurement specialists. The strength of this approach was that it allowed for a systematic approach to risk identification and management, using the best techniques and approaches from government and industry.

Programme delivery involved assessing and managing works at 301 schools in Victoria identified as being particularly bushfire prone. The focus of the project was to identify, at each school deemed to be at bushfire risk, a school-specific shelter in place (SIP) and other mitigation measures that could be implemented to reduce risk from bushfires. A school's SIP is required as part of the school's emergency management planning and is a place of absolute last resort after all other options have failed.

While predicting fire behaviour under Code Red conditions is extremely problematic, a categorisation scheme for bushfire does exist and is based on Australian Standard AS3959-2009, which allowed for the categorisation of at-risk school buildings into one of six bushfire attack levels (BAL). The BAL system is in turn linked to a series of provisions under the Building Code of Australia that relate to protection from radiant heat and embers.

These assessments were undertaken on educational infrastructure and buildings across Victoria, classifying them from low to extreme, commensurate with geographic location and perceived vulnerability. Subsequent to this initial assessment of BAL ratings, the SBPP commenced in September 2010, with a scheduled completion date for those schools where works were required being November 2011.

Delivering the Programme

The programme and methodology was specifically designed through workshops with school principals and representatives of the Department, who had full access to the senior team of project managers, fire safety and fire protection engineers, ecologists and GIS experts. The resulting approach was structured to provide a high level of strategic direction, quality control, technical output and project coordination.

Following initial reviews and site visits, the project team identified the following key issues:

- The level of risk exposure to vulnerable communities, specifically school children and teachers, would have been elevated if the February 2009 bushfires had occurred on a weekday, rather than a weekend.
- The provision of a shelter in place (SIP) at each school would provide, for the first time, an independently assessed building into which students and staff could retreat while awaiting evacuation, or as a shelter in the absolute last resort.
- Investigations to determine the SIP requirements, and the capital investment to construct them, were relatively nominal and ranged from AU$ 10,000 to AU$ 200,000 for each school site.
- The programme had the prospect to reduce the potential for bushfires to impact on schools through targeted and sensitive vegetation management. The blend of bushfire management, environmental and building fire engineering expertise allowed for significant flexibility and innovation in designing solutions for individual schools.

Delivering the Solution

Working with technical partner Ecobiological, the team developed a methodology for delivering the BAL assessment programme in conjunction with the DEECD and other stakeholders.

The methodology followed a process that allowed the field assessment teams to build a bushfire risk profile of individual school sites to provide a powerful decision support tool. The process was cross-disciplined and involved biological sciences, program managers and specialist engineers.

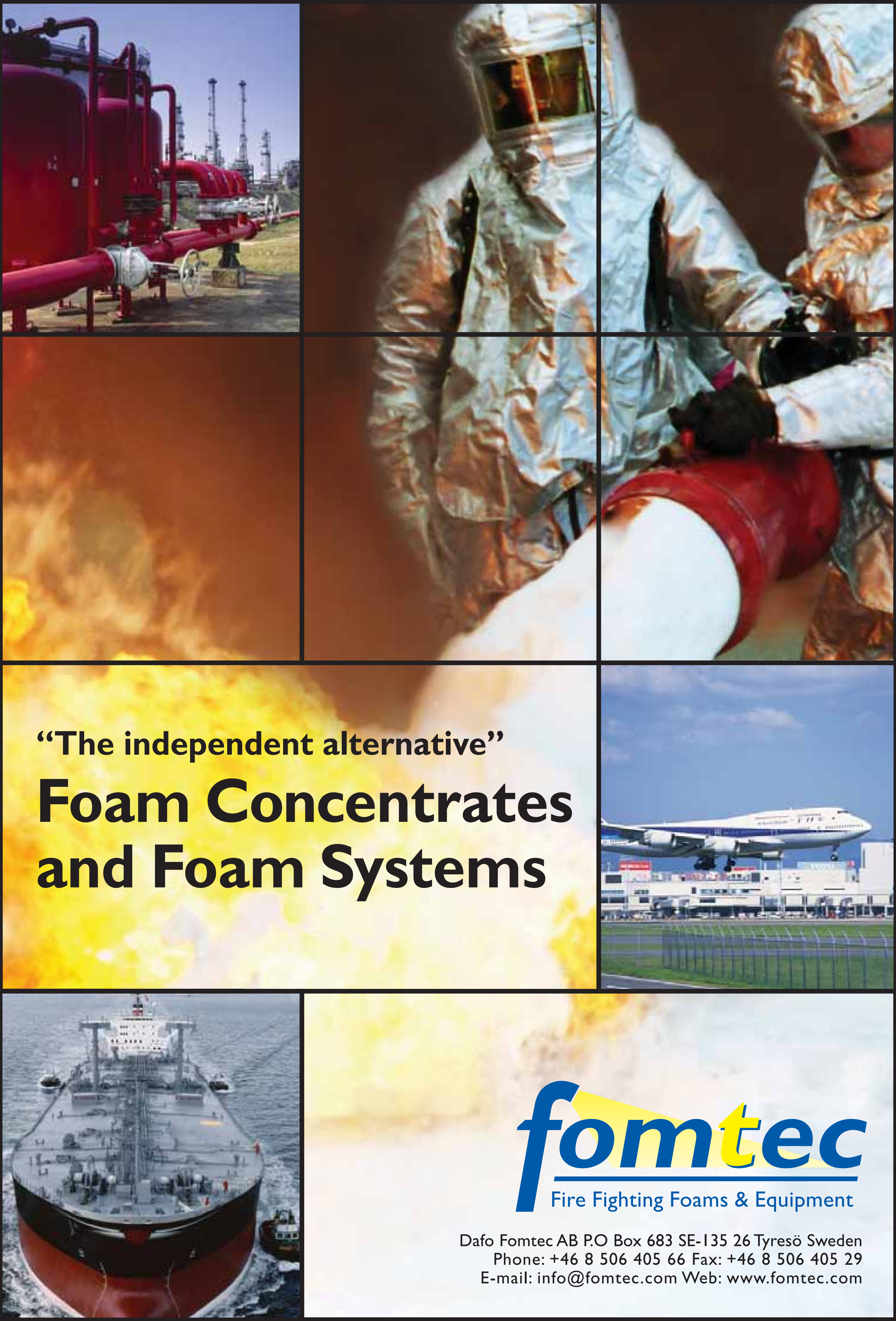
The process was broken down into six key deliverables:

1 Initial Assessment of Bushfire Prone Areas

The first and most basic step was determining if the site was within an area designated as bushfire prone land. Registers of bushfire prone areas are most commonly maintained by state and local agencies, and this designation was checked and confirmed by an in-house planning team. All sites within bushfire prone areas are required to consider bushfire risks in accordance with AS3959 *Building in Bushfire Prone Areas* when building or modifying existing buildings.

2 Classification of Vegetation into Fuel Types

Most areas of Australia have some form of vegetation mapping, but this is normally done on



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Case Study – Chum Creek Primary School

For higher risks sites, sprinkler systems provide additional protection

Chum Creek Primary school is located 50km north east of Melbourne in Victoria. The school has around 50 students.

Chum Creek represented a school with very high fire risk, and was one of the first schools completed. The school is surrounded on all sides by tall open foothill forest, which places significant portions of the school in the flame zone. The site had crown fires on the grounds during the 2009 Black Saturday fires and the playground areas suffered significant damage. The pine plantation directly to the north of the site was destroyed in the fires and has now been completely removed. This removed a major source of fuel, but the remaining forest still represents a significant risk during high fire danger periods. Road access to the site is also heavily forested, and as a result a dedicated Shelter in Place was an important risk mitigation measure.

The site had an existing shelter that was put in place after the Ash Wednesday fires in February 1983 but significant issues remained with this building, including:

- Sprinkler/drencher was a pull-start motor that female staff were unable to operate.
- Window shutters were heavy and could not be closed from within the building.
- Significant areas of exposed wooden beams.

Works completed at the school include the removal of all eucalypts and acacias, removal of all trees with a diameter greater than 50cm, the application of fire retardant paint to external timber building elements, new fire shutters, new fire doors and the provision of an automatic start pump to the existing sprinkler system.

While the school is still in a high risk category, the vegetation management works and improvements to the Shelter in Place Building at the school have dramatically reduced the risk of loss of life in the event of a fire.

an ecological basis. As bushfire fuel classifications are slightly different, this initial mapping of vegetation was taken as a starting point, and then re-classified into the relevant fuel type under AS3959. This is both the single most important input into the modelling process, and the area in which the most common mistakes are made by inexperienced assessors.

The project fire management experts were backed by senior ecologists with extensive fire management experience to manage this process and provide the highest quality input data to the bushfire modelling.

Ecologically-based mapping was still valuable as this allowed the field assessment teams to identify potential environmental constraints, particularly habitat for threatened species. This is critical as the vegetation management needs to be sensitive to the environmental requirements of surrounding bushland, both now and into the future.

3 Calculation of Slopes

Slope has a dramatic influence on fire behaviour, with the rate of spread (speed) of a fire roughly doubling for every ten degree increase in upslope (steepness). The Geographic Information Systems (GIS) specialists were able to provide an initial calculation of slopes across the site, which was later checked in the field.

4 Production of Initial Heat Contour Maps

The methodology for delivering the BAL assessment involved fine scale, GIS modelling of fire causal factors (such as fuel load, aspect and topography) to create heat contour maps and determine the specific fire risk exposure for each school. Once the fuel and slope affecting the site have been determined, modelling of bushfire risk zones was undertaken and plotted onto a modelled fire extent across the entire site, and was categorised into the following zones:

- **Flame zone** — representing the area of direct flame contact and is the most hazardous area. Buildings within this zone need to be specifically engineered if they are to survive and there is extreme hazard to people.
- **Building safety line** — representing the zone where 10kW/m^2 of heat energy will be generated. Provided that they are secured against ember attack, buildings have a high chance of survival outside of this zone and it is also the limit of safe firefighter operations, effectively defining the defendable space around a building.
- **Personal safety line** — representing the zone where 2kW/m^2 of heat energy will be radiated from the fire front. This is the zone where people in normal clothing can be expected to survive with minimal risk of injury.

5 Field Checking

Modelling is an effective decision support system, but requires careful checking against on-ground conditions. Site visits were used to check for environmental and heritage constraints, and as an opportunity for consultation with school principals and senior staff. The heat contour maps allowed for genuine consultation with affected stakeholders. The visual mapping of risk zones facilitated a discussion on what could be done to address the risk.

The team's senior fire management specialists for the project included highly experienced ecologists, and these staff have previous experience in designing asset protection zones that are sensitive to the ecological and aesthetic values of the surrounding bushland. Once all practical approaches to reducing the fuel hazard have been developed, the modelled exposure to buildings is re-calculated for the application of engineering upgrades.

6 Engineering a Solution – Effective, Sustainable and Consultative

Drawing upon expertise in building engineering, the building fire management teams modelled heat intensity to design a range of building upgrades to meet AS3959.

The level of building upgrades were specific to each situation, but commonly included the following elements:

- Ember screening on all potential entry points (such as windows, weep-holes and roof vents).
- Upgrades to window glass to increase resistance to breakage under higher heat loads.
- Changes to exterior building materials, including decking, walls and roof materials.
- Bushfire shutters on windows and doors.
- Sprinkler systems to 'wet down' the building and surrounds.

Significant among the breadth of the SBPP projects was the establishment of a programme of work in high bushfire risk locations. APF

Gerry Quinn is an Executive with Aurecon

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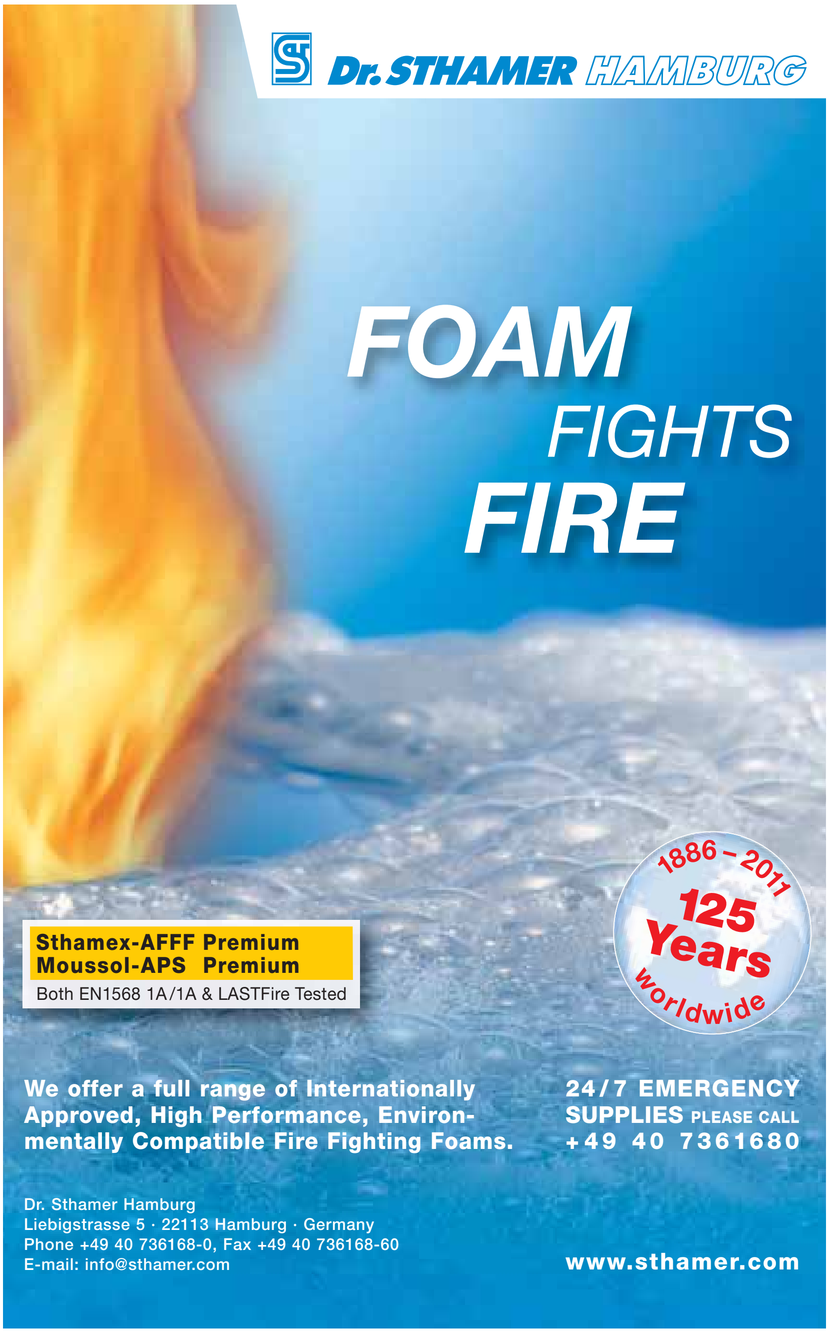

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DST-3P4	5.5	14885	18", 4-Blade	81 lbs.	23" X 23" X 21.5"
DDST-3P4	5.5	14885	18", 4-Blade	82 lbs.	23" X 23" X 21.5"
DST-3P4-L*	5.5	14885	18", 4-Blade	85 lbs.	23" X 23" X 21.5"
DST-3P4-6.5	6.5	17000	18", 4-Blade	91 lbs.	23" X 23" X 21.5"
DST-9P4	9	17500	20", 4-Blade	115 lbs.	26" X 23" X 21"
DST-13	13	22000	24", 4-Blade	136 lbs.	30" X 28" X 24"

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E18SP	2	12000	18", 2-Blade	85 lbs.	21" X 21" X 18"
E18P4	5	22000	18", 4-Blade	88 lbs.	23" X 23" X 16"
EB18SP	1.25	12000	18", 2-Blade	90 lbs.	21" X 21" X 19"
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Evaluating and Implementing PPV

Leroy Coffman

Tempest Technology Corporation

Positive Pressure Ventilation (PPV) is a firefighting tactic that involves the use of high-powered ventilation fans to remove smoke, heat and gases from burning structures, thereby enhancing safety for first responders. There are many considerations when deciding whether PPV is right for your fire brigade and how it will be integrated into existing tactical operations.

Positive Pressure Ventilation works on the principle that air will always flow from an area of high pressure towards an area of low pressure. To apply PPV, a gasoline or electric powered fan is positioned in front of the firefighters' access point in order to force fresh air into the structure (the high pressure point). At the same time, an exhaust opening is created where the smoke and heat are to be exhausted (the low pressure point). The air pressure created by the fan forces the air in the structure towards the exhaust opening, taking smoke and heat with it. The resulting improved visibility and reduced interior temperature make it easier and safer for firefighters to enter the structure. PPV is most often applied after the fire has been extinguished, but it can also be applied prior to extinguishment with a technique called Positive Pressure Attack (PPA).

PPV and Firefighter Safety

Positive pressure ventilation is first and foremost a tool to enhance safety for firefighters and other first responders. It gives firefighting personnel a greater level of control over a hazardous or dangerous interior environment. During fire suppression activities, PPV can dramatically improve visibility inside the structure, making it easier for firefighters to conduct search and rescue operations and locate the seat of the fire. PPV can also dramatically reduce interior temperatures, making it easier for firefighters to move within the structure and reduce the chance of flashover. Opponents of positive pressure ventilation will claim that PPV can intensify a fire by introducing fresh air, thereby making the situation more hazardous. In fact, PPV is not adding any more 21% oxygen than already exists in the interior environment and it rapidly reduces the interior temperature while removing the unburned particles of combustion. Smoke will become fuel when the temperature is high enough and PPV limits the fire's ability to reach the temperature at which smoke will ignite.

One of the most significant benefits that PPV offers firefighters is added protection from the carcinogens in smoke. Many of the contents in a modern structure fire are made of synthetic and petroleum-based materials. The gases that are emitted when these materials burn pose serious health risks to firefighters over the course of their careers. By applying positive pressure ventilation after the fire has been extinguished and during the overhaul phase, firefighters can achieve an added layer of protection from the gases that linger after the fire has been extinguished.

Availability of Positive Pressure Training

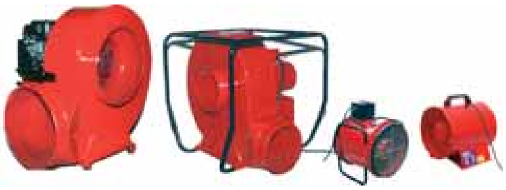
For positive pressure ventilation to be implemented safely and effectively, every person on the fire ground must understand how PPV will be implemented and the role that they will play in the operation. Without a coordinated ventilation operation, PPV cannot be applied safely and effectively. To accomplish this, all personnel should go through a positive pressure ventilation training course that includes hands-on experience with a PPV blower. It is important that this training course includes some type of live fire exercise. The best way for a student to clearly understand the positive impact that PPV can have is to experience it during a live fire training exercise. Many firefighter training academies offer a section on positive pressure ventilation. It will involve a day of classroom training on PPV concepts and hands-on training in a burn tower or fire simulator.

Demand for PPV training has prompted a number of instructor groups to begin conducting on-site training for a fee. These instructors will travel to the fire brigade's training facility to conduct both classroom and hands-on training for all incident commanders and firefighters. Once they have concluded their classroom training, every student will have the opportunity to practice implementing positive pressure ventilation in a highly realistic environment. One training group in the United States will even provide the construction plans for a 150 square meter burn building that simulates a typical American single-family dwelling.

PPV Equipment

There are numerous manufacturers of PPV equipment and all offer products that have similar features, functions and performance. A typical positive pressure ventilation fan (also referred to as a blower) consists of a 450mm diameter fan blade, a gasoline or electric motor, and a fan shroud to protect personnel from the spinning fan blade. All of these components are mounted to a metal cart that allows the PPV fan to be rolled by one firefighter to the appropriate ventilation point.

Most PPV fans are small enough to fit inside a standard vehicle compartment. Other tools for PPV include large vehicle-mounted fans that are used to ventilate very large structures. These large fans have 1250mm or 1500mm diameter fan blades and can generate up to 255,000 cubic meters of air an hour. When evaluating which positive pressure ventilation tool to purchase, it is important to consider the compartment size of your vehicle, the types of structures you will be ventilating, and whether you prefer gasoline or electric powered blowers.



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Compartment Size

Compartment size can be one of the most important considerations when purchasing a PPV blower. Today's fire brigades are called on to perform services far beyond basic firefighting. The equipment that is required for fire suppression, EMS, rescue and Hazmat response makes compartment space on a fire apparatus valuable and scarce. This issue encourages fire departments to purchase the smallest PPV blower they can find. While a 400mm blower might meet a fire brigade's compartment space limitations, it can put limitations on the effectiveness of PPV due to the smaller air pattern and reduced CFM relative to a 450mm or 530mm blower. A good rule of thumb is to purchase the largest blower that will fit into your available compartment space. Most fire departments will try to make space on their apparatus for a 530mm blower and will settle for a 450mm size when necessary.

Type of Structure

It is important consider the types of structures you will be ventilating and choose the type of PPV blower that is best suited to your environment. If your community has many smaller single-family residences of 100 to 200 square meters, a 450mm or 530mm blower will be adequate. If your fire brigade protects commercial structures that range from 300 to 700 square meters, a larger PPV blower such as a 600mm or 680mm will be more desirable. If your fire brigade encounters incidents involving large commercial structures or high-rise buildings, it may be beneficial to have a large mobile fan of 1250mm or 1500mm diameter. In situations where a large structure must be ventilated with smaller PPV blowers, it is possible to use multiple blowers to achieve greater air volume and therefore adequate ventilation of smoke, heat and gases.

Gasoline or Electric Power

When deciding whether to purchase gasoline or electric powered blowers, the user should consider how they will implement PPV and their access to electric power. If a blower is being used for fire attack (before fire extinguishment), a gasoline blower can be setup in much less time and will provide better airflow performance. If a blower is being use during fire overhaul (after fire extinguishment), an electric blower will introduce less carbon monoxide into the building and will generate less noise on the fire ground.

A note on the performance of electric PPV blowers. The first positive pressure ventilation blowers were gasoline powered due to the amount of air volume required for PPV to work effectively. In recent years, new developments in electric motor technology have greatly improved the power and performance of electric PPV blowers. Inverter drives allow motors up to 1.5kW to operate on a 20amp circuit and generate airflow performance that is 60% to 70% of a comparably sized gasoline powered blower. When purchasing an electric blower, it is important to consider the

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generator power required to operate the PPV blower in addition to all the other equipment on your vehicle.

PPV Airflow Ratings

The airflow performance of a positive pressure ventilation fan is an important consideration for users of PPV. Blower performance is measured in cubic meters per hour (m^3/hr.) or cubic feet per minute (CFM) and there are many methods for measuring the performance of a PPV fan. It is common to see the performance ratings for a 400mm PPV fan vary widely from one manufacturer to the next. For example, one manufacturer may claim that its 400mm blower with 4.1kW engine generates 43,100 m^3/hr. (25,350 CFM) and another claims that its blower with the same sized engine and blade generates 26,300 m^3/hr. (15,500 CFM). All 400mm fans with 4.2kW engines will move approximately the same amount of air. It is the way that the airflow performance is measured that will result in wide differences between the published numbers. It is important to compare airflow performance using the same test method. Many manufacturers are using a performance standard established by the Air Movement Control Association (www.amca.org) and this has proven to be a good relative measure of PPV fan performance. Some manufacturers claim that their products are AMCA tested and certified but they have no affiliation with AMCA. It is important to verify a manufacturer's association with AMCA before accepting its AMCA airflow numbers.

Positive Pressure Attack

Positive pressure ventilation began as a tool to assist with removing smoke and gases after the fire has been extinguished. As the understanding of the physics of positive pressure ventilation has evolved, it is being applied in new ways and for new purposes. The most dramatic development in PPV tactics has been its use for positive pressure attack (PPA), which refers to the use of PPV blowers during the initial phase of fire attack.

After size-up, firefighters will determine whether PPA is an appropriate tactic to use. A PPV blower is positioned at the point where firefighters will enter the structure and a firefighter is stationed at the point where the internal gases will be exhausted. When firefighters are ready to begin PPA, the exhaust opening is created by opening or breaking a window or opening a door. As soon as the exhaust opening is created, the PPV blower is started and the air pattern is aimed into the entrance opening. Once positive pressure ventilation has started, the firefighters wait up to 30 seconds for conditions inside the structure to being improving.

The most obvious indication of improving conditions is improved visibility inside the structure. Almost immediately after the PPV blower is started, visibility inside the structure will improve, allowing firefighters to see a clear path of access to the interior of the structure. Positive pressure attack allows firefighters to begin controlling the environment inside the structure before they enter it and allows them to begin reducing the interior temperature and improving visibility at the moment they begin their fire attack.

Final Words

Positive pressure ventilation (PPV) and positive pressure attack (PPA) are not for every firefighting situation and should never be attempted until all personnel on the fire ground have been trained on proper tactics and techniques. Access to PPV training materials and resources can be sourced via www.positivepressureattack.com and www.positivepressureventilation.com. APF

Leroy Coffman is President of Tempest Technology Corporation

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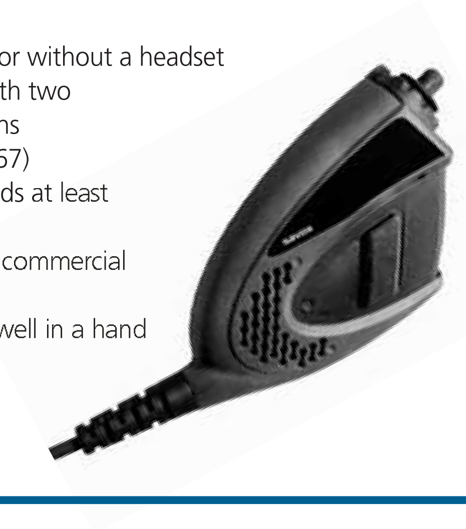

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Mass decontamination voice amplifier

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Firefighting & Rescue Communication

The role of the modern fire departments is ever changing. No longer responsible for just fire suppression, most departments routinely respond to incidents involving specialised rescue disciplines such as HazMat, vehicle extrication, confined space, water rescue and urban search and rescue (USAR) to name a few. Within these diverse rescue situations the need for appropriate personal communications gear is particularly important. However, deciding what type of communications gear is needed is not always cut and dry.

Considering the type of communications gear that is needed for a department is an important decision, therefore it is important to consider the types of situations a department may become involved with. Traditional radio accessories such as remote speaker microphones (RSMs) used by fire departments might not be appropriate, or even functional, in other rescue situations

CRBNE & HazMat

Portable hand-held two-way radios are the most common type of communications equipment used during CBRNE and HazMat situations. That is because they can be used effectively in many environments and can handle an unlimited number of users. Some drawbacks to portable radios are that they work best when out in the open – in confined spaces they are much less reliable. In addition, radio transmissions can be broken up or even monitored by outside sources. In situations where a victim's intimate details are being broadcast it is important to remember that those outside of a decontamination area may be listening.

With portable radio communications use being

FIREFIGHTER COMMUNICATION

Large surface PTT with standard headset and boom microphone

so prevalent, there are special considerations that should be made for CBRNE and HazMat situations that require protective equipment. Items such as fully encapsulated suits, facemasks and other breathing apparatuses can all lead to problems with communication among personnel. In this case the very equipment designed to protect responders can also lead to a potentially dangerous situation if communication is not possible. There are a variety of portable radio accessories that can be utilised during CBRNE and HazMat situations that allow protective equipment to be worn, while also ensuring localised and command communication functions. Listed here are some examples of solutions that are readily available, as well as a brief summary of common potential benefits and drawbacks to each.

- **Remote Speaker Microphones**

Remote speaker microphones (RSMs) will be familiar to all public safety professionals using radios and in some cases portable Tetra terminals. They typically are supplied by manufacturers as part of the communication system. RSMs work best when speaking directly into the face of the unit. When external factors such as PPE, facemasks, HazMat and CBRN suits are introduced their effectiveness is diminished. Some RSMs have the ability to plug in to external devices such as microphones, speakers and headsets.

- **Push-to-Talk (PTT) vs Voice Operated (Vox)**

In HazMat situations – where bulky suits and gloves make it challenging to access the PTT switches to initiate communication over a radio or terminal – users are quick to look for a voice activated solution.

However, careful testing needs to be done before committing to a Vox system. External factors such as environmental or background noise, respirator noise and noise levels inside the suit can negatively impact Vox effectiveness. Additionally, if a user gets hurt and screams out in pain this can lock a system at the exact moment when it is needed most. Push-to-talk solutions, while appearing to be more low-tech than their Vox counterparts, tend to be more reliable in general HazMat or high noise applications. PTT switches come in a variety of shapes and sizes that can be positioned and reliably activated underneath protective suits and clothing or in high noise environments. Some products have the option for a wireless remote PTT switch to be placed externally on equipment, for example vehicle controls, so that the hands do not have to leave their position to initiate communication.

- **Throat Microphones**

Throat microphones pick up the vibrations from the throat and therefore must be worn around the neck. They are usually secured in place with a strap or neckband to ensure contact between the microphone and the voice box or Adam's apple of the user. Proper position of the throat microphone is key; if the unit is not worn properly it can lead to poor communication and discomfort of the neck. Some throat microphones include an integrated PTT button as well. When worn and used correctly, throat microphones are especially useful in high noise environments.

- **Boom Microphones**

The boom microphone is typically part of standard headsets and is best suited to situations where breathing apparatus is not needed. There is a wide variety of headsets on the market that include hearing protection both passive and active. The key to clear transmissions is in the microphone, particularly in high noise areas. Manufacturers use a variety of technologies, some acoustic and some digital, to try to minimise background noise.

- **Ear Microphones**

Worn inside the ear, the ear microphone picks up voice vibrations from the ear and surrounding bone. However, this type of microphone will only work properly if it fits snuggly within the ear canal so that all other outside noise is blocked. If an ear microphone does not fit properly it is more likely to fall out – something that is particularly difficult to deal with when wearing a fully encapsulated suit. When using ear microphones for communication during a CBRNE situation having a custom ear mould made should be a serious consideration. One often overlooked drawback of this type of microphone is the "time on station" and the ambient temperature in the work environment that can cause discomfort.

- **Bone Microphones**

The bone microphone is worn either on top of the skull or around the ear. These are most likely to be attached to a helmet suspension or strapped to the head itself. They function by picking up the voice vibrations of the skull and a key to their

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Wired RSM PTT with headset connector

correct performance is good bone contact in order to function properly. Therefore, an assessment of other protective equipment that requires wearing hoods or large straps that traverse the head will likely affect the quality of bone microphone communication.

- **Voice Amplifiers**

Voice amplifiers are simple yet effective devices that either attach to the face mask or are worn on the body; the main function of these products being to amplify the voice.

The source of sound can be either a microphone embedded in a facemask or an off mask solution such as a throat or bone microphone. These types of voice amplifiers are particularly beneficial because they can work with any make, model or style of face mask providing a cost effective and versatile solution. More complex voice amplifiers are available that can bridge the gap between both face masks and communication devices such as portable radios or terminals. These products provide communication over a communications network while also providing localised voice amplification. A voice amplifier is particularly useful during a decontamination event where communicating with the general public and keeping people calm is so important. With clear and direct communication it is much easier for medical personnel to properly direct victims through the decontamination process while minimising panic.

Urban Search & Rescue/Confined Space Rescue

When rescuers enter a confined space or an underground location, maintaining voice contact with the outside world is extremely important. Feelings of claustrophobia, stress or panic can be experienced by even seasoned responders and while these feelings can be controlled, they can surface very quickly if a problem occurs.

In confined space and collapsed rescue situations the preferred communication tool is a full duplex hard wired intercom system as they are a much more trustworthy option over two-way radio communications. That is because in confined space environments wireless radio communication is subject to dead spots, fading and weak signals. During confined space rescue operations where a supplied air breathing apparatus is required the hardwired communication cable can be "piggybacked" onto a breathing airline, making a single umbilical that is easily managed by the entrant.

With the previously addressed shortcomings of many wireless radio communications systems, a hardwired communications system is the best investment for any department involved with confined space rescue. A fully duplex hardwired system that is completely hands-free will provide a dedicated and private network for first responders as they are working. Ideally, a hardwired system will meet the following requirements: electrically shielded, resistant to chemicals, IP rated, intrinsically safe, hands free and extremely rugged.

The key drawback of a hardwired communications system is the communication cable itself. The major issue being that there is a limitation in terms of length of the cable. In addition, the cable can snag or become caught on debris in a collapsed structure. However, it is still more beneficial to have a guaranteed, constant line of continuous communication between the responder and the safety attendant above ground – without the worry of interference or dead spots.

Mobile Phone Technology

Mobile phone usage has increased dramatically over the past decade and its use as a communications tool within fire services should not be overlooked. Department members may utilise their mobile phones for a variety of functions including connecting with other team members or utilising the Internet or specialised software applications (apps) to access relevant information. Future interoperable systems that utilise a mobile phone type network backbone will no doubt work their way into regular use over time, perhaps even surpassing radio systems in the future. Keep a look out for ruggedised handsets and accessories that will operate in a professional work environment. These include wireless push over cellular remote speaker microphones and a variety of Bluetooth enabled wireless PTT's and ruggedised accessories for harsh work environments.

Conclusion

The role of fire rescue services around the world is ever changing and in these days of shrinking budgets and economic hardship it is more important than ever to choose equipment that is not only suitable for the task but will survive the work environment as well. Doing more with less is a dilemma that faces commanding officers and fire chiefs on a daily basis. Many manufacturers offer to loan demonstration equipment for trial by potential users, a program that more departments should take advantage of. Communication equipment, when correctly selected and applied, can produce real results by increasing productivity, efficiency and safety. APF

Andy Ibbetson is Senior Vice President of Marketing and **Lauren Girdler** is Marketing Manager at Savox Communications

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Are you ready for BS EN54-23?

Normal hearing is taken for granted by most of us, but there are estimated to be nearly nine million people who are deaf or hard of hearing in the UK alone, equivalent to one person in every seven.

For the deaf or hard of hearing, reliance on audible alarms in the event of a fire is ineffective. In addition, increased concerns over health and safety are encouraging the greater use of ear defenders in the work place and so there is a sizeable contingent of people who work in environments where alarm sounders are unlikely to be heard.

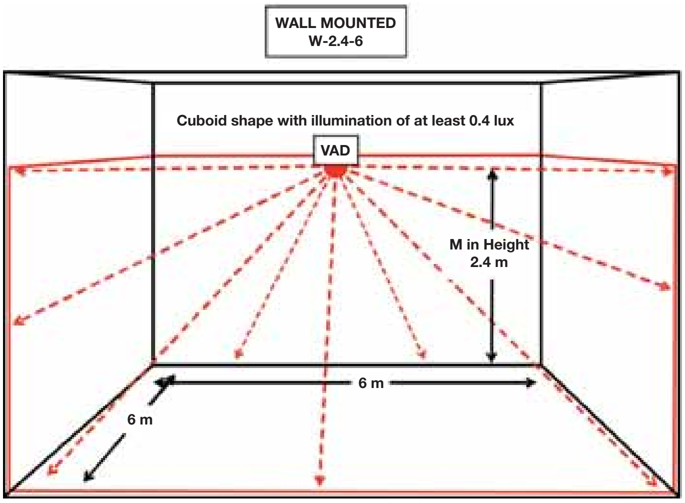
To overcome these issues, signalling needs to be broadened to stimulate senses other than hearing. Supplementing audible alarms with visual alarm devices (VADs) is an effective way to warn people in or around a building of the occurrence of a fire emergency so they can take appropriate action. Over recent years, the installation of VADs has experienced considerable growth and this trend continues due to the influence of the equality legislation and their suitability for various applications including staff-restricted warning systems, (such as nursing homes and public assembly buildings), broadcast studios and hospital operating theatres.

Current UK building regulations and BS 8300, *Design of buildings and their approaches to meet the needs of disabled people,* recommends that a VAD is sited in any area where a deaf or hard of hearing person may be left alone, for example, toilets or bedrooms. This, alongside the rising awareness of equality legislation highlights the increasing importance of the industry being vigilant in designing fire systems with the deaf and hard of hearing in mind.

BS EN54-23

Up until May 2010, there was no fire industry standard in the UK that determined the light output performance criteria and installation requirements of visual alarm devices. This gave rise to manufacturers specifying the performance of their products in an inconsistent, confusing and often misleading way. The use of Joules, Watts and Candela to specify a VADs performance are all largely meaningless, as they do not take into account the effectiveness of the light signal over a given area. Now this has been rectified with the release of standard BS EN54-23: *Fire alarm devices – Visual alarm devices.*

BS EN54-23 specifies the requirements, test



methods and performance criteria for VADs in fire detection and fire alarm systems. Manufacturers must now present the products performance data in a uniform manner so they can be directly compared and their suitability assessed for particular applications. All VADs sold for fire use in EU countries must be manufactured and certified to these requirements by 1st March 2013. For countries such as the UK, which do not currently require CE marking to the CPD, compliance will be enforced from July 1st 2013 when the Construction Products Directive (CPD) is replaced by the Construction Products Regulation (CPR).

The Fire Industry Association (FIA) and the Loss Prevention Certification Board (LPCB) have jointly published *COP0001 Code of Practice for Visual Alarm Devices used for Fire Warning*, which directly compliments BS EN54-23 and BS 5839-1. It provides guidance and recommendations on the planning, design, installation, commissioning and maintenance of VADs in and around buildings, other than single-family dwellings.

Coverage Volume

VADs will now be classified into three categories based on their intended application, namely ceiling-mounted devices, wall-mounted devices and an open class category. Each of these categories has specific targets for light distribution patterns in order to be compliant with EN54-23. Manufacturers should now ensure products are tested and assessed by an EU notified body to determine its coverage volume, based on the distance at which the required illumination of 0.4 lux or 0.4lm/m^2 is met. The manufacturer must specify the coverage volume with the device; either on the product or with supporting documentation. Therefore, specifiers should always look for the coverage volume specification code. Note – the flash rate of a VAD should be between 0.5Hz and 2Hz and should emit either a red or white flash (only red or white in EN54-23).

Different light dispersion characteristics are required according to the VADs intended mounting position. Wall-mounted VADs will be effective in a wide range of applications, but the manufacturer will be required to state a mounting height; which is a minimum 2.4 metres, followed by the width of a square room over which the VAD will provide coverage. Therefore, the specification code with a VAD suitable for a wall application could read W-2.4-6; that is, mounted at a height of 2.4 metres the VAD will cover a room six metres square. The VAD will therefore be required to cover the volume below its mounting height. Any light going upwards will be wasted as far as this categorisation is concerned.

Ceiling-mounted VADs are suitable for broad coverage in regular shaped rooms. Ceiling VADs must state the height of the ceiling at which it is designed to operate. This can be three metres, six metres or nine metres. The VAD in this case needs to radiate light in a cylinder below the mounting point. Therefore the specification code could read C-6-6; that is, mounted at a ceiling height of six metres, the VAD will cover cylinder six metres in diameter.

The open class category allows for different light distribution patterns that do not fall within the restrictions of the wall or ceiling. The shape of the pattern and its coverage volume must be determined and stated by the manufacturer; however the minimum illuminance of 0.4 lm/m^2 is still required.

Design

External factors can have a significant impact on the effectiveness of VADs. LPCB COP 0001 advises that when designing systems incorporating VADs, it is important to consider what these influences, such as the level of ambient light, the reflectivity of surfaces, effect of colour, the required field of view and the use of tinted eye protection may have at the onset of the design.

● Ambient Lighting

Because of the large variations in ambient light levels that can exist in some locations, it is important that the highest level expected should be considered when selecting VADs. Measures to control the ambient light, such as blinds or curtains may help reduce its impact. A lux meter complying with BS 667 should be used to determine the ambient light levels, although it should be considered that light levels in some rooms with large window areas will vary throughout the day and from season to season.

● Reflective Surfaces

It is important to assess and understand the types of surfaces involved as different materials will react differently to the emitted light. The reflection of light may be specular; for example, a glass mirror or diffused reflected light in many directions such as from a granular surface. Many surfaces will exhibit both types of reflections.

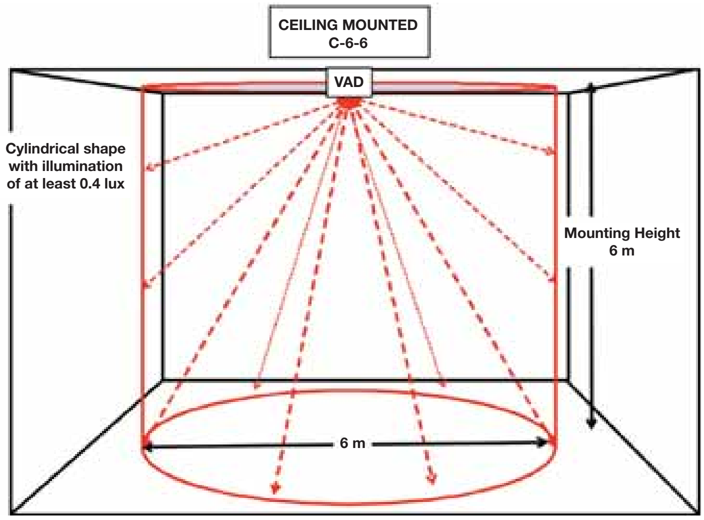
● Field of View

Consideration should also be given to the presence of any obstructions in the field of view, such as partitions or furniture, as this could affect the VAD coverage. At any position within a space where a VAD is required, any individual should be able to view its light directly or reflected from adjacent surfaces.

- **Environment**

The selection of VADs should also take into consideration the nature of the environment where it is intended to be installed. Type A VADs require a minimum ingress protection (IP) of IP21C, while Type B require a minimum IP of IP33C for more exposed locations.

When considering the siting and spacing of VADs in a room, it should be ensured that all occupants of the room have a clear line of sight of the device, but there should not be undue dependence on this in applications such as an office, where people predominantly spend their time looking at computer screens or focusing on a specific activity. Reflective surfaces can increase the field of vision by providing multiple paths for the light to attract attention. Where the space to be covered is larger than the specified coverage volume of a device, a sufficient number of devices should be sited to ensure the required illumination levels are satisfied.



Power Consumption

To meet the requirements of BS EN54-23 and cover the practical room size encountered in most situations, VADs will be required to have higher light output levels than those generally used in the market today. Higher illuminace levels will result in a significant increase in current consumption due to the use of higher output devices or to a greater number of less powerful units.

Application of the inverse square law to light radiating from a point implies that: "to double the distance from a light source will require four times the power to achieve the same level of luminosity". LED technology can offer a breakthrough here, offering more efficient production of light, leading to lower power requirements than Xenon tube-based devices. Although the initial cost of LED VADs may be slightly more expensive than Xenon products, the more efficient operation that LEDs offer means the number of devices required on an alarm circuit is reduced, consequently reducing the burden on control panel power supplies and decreasing installation costs by avoiding supplementary power supplies. This should be considered in the design of a system.

Ahead of 1st March 2013 when BS EN54-23 becomes mandatory, it is an opportunity for the industry's leading manufacturers to build on existing expertise and experience to develop innovative solutions to the issues of power consumption and the challenges that light output and flash colour present.

A further strain on power consumption can be the flash colour. Across most of Europe a flashing red light denotes a fire alarm signal; however red light consumes more power than white light for the same intensity. To achieve red light, white light, particularly from xenon tubes, has to be filtered by a lens that allows, only the red wavelengths to pass through. This can reduce the light output by up to 80 percent and therefore require more higher-output devices to achieve the require illuminance levels.

The BS EN54-23 requirements of 0.4 lm/m^2 means that using red light requires a big increase in current compared with the same illumination using white light; this is exacerbated when room size is factored in. System designers are presented with a dilemma; should they offer a white flash to save power consumption and move away from the traditional red light associated with fire, or should they factor in the price of additional power supplies and installation costs, significantly increasing the total cost of the system?

The choice to use red or white VADs may not just be down to cost, the long established use of red for fire in some organisations may require a change in culture and retraining, but it should also be considered that whatever colour is chosen, it should be used consistently across the whole site, so existing beacons may have to be removed or changed.

Ahead of 1st March 2013 when BS EN54-23 becomes mandatory, it is an opportunity for the industry's leading manufacturers to build on existing expertise and experience to develop innovative solutions to the issues of power consumption and the challenges that light output and flash colour present. This should make the transition as easy as possible for those operating in the industry, including risk assessors, installers, system designers and commissioning officers. APF

Leanne Danby is Marketing Executive at Cooper Fulleon

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Malaysian USAR Operation at Collapsed Multi-storey Building

Jupiri Apou

Fire and Rescue Department of Malaysia

The construction industry is among Malaysia's most hazardous industrial environments, with the rate of reported accidents being high when compared with other industrial sectors. As in many countries, responsibility for rescue operations falls on the fire and rescue service, in this case the Fire and Rescue Department of Malaysia (FRDM).

Typical of the type of search and rescue operations undertaken by the FRDM was the sudden collapse of the five floors of a 38-floor building under construction owned by the Kerjasama Rakyat's Bank in Brickfields, a small to medium-sized town and residential neighbourhood located just outside central Kuala Lumpur. 13 construction workers were trapped; one died at the scene and two were seriously injured. The remaining ten workers were uninjured as they had managed to cling to the building's fifth-floor floor beams, 30 metres above the ground.

The emergency call was received at the State Operation Centre (SOC) Fire and Rescue Department of Kuala Lumpur. The fire and rescue service from the nearby town of Pantai was the first to respond and immediately set about establishing strategies for the search and rescue operation, which was monitored at Fire Forward Command Post (FFCP) that had been established on the site. Meanwhile, additional assistance was received from the Kuala Lumpur Central Fire and Rescue service and the fire and rescue service from Sentul FRS, the main town area of Kuala Lumpur.

Search and rescue operation was successfully performed in which three people were extricated from the collapsed building. The remaining ten workers known to be in the building were successfully moved to safety. A canine search team then conducted a thorough search for other possibly trapped victims. This particular specialist unit comprised seven officers with four trained dogs.

Incident Operations Management

In order to achieve search and rescue operation objectives a management structure called Operations Management System (OMS) was formed at the incident scene. This comprised an operation Commander, and reporting directly to him was a safety officer, a liaison officer, a planning officer,

an operation officer, a logistics officer and a documentation officer. An emergency medical services officer, a communications officer and a canine operations officer in turn reported to the operation officer.

The task of the OMS was to monitor, control and improve the effectiveness and efficiency of the overall management of search and rescue operations at the incident scene as well as to coordinate assistance and promote close cooperation with other agencies. Incident information transmitted via the communication system established in the State Operation Centre gathered information and disseminate it to senior officers around the Federal Territory of Kuala Lumpur and FRDM Head Quarters in Putrajaya, Malaysia.

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A two-way communication system was set up between the Fire Forward Command Post (FFCP) and other emergency agencies using telephone lines and fax machines. Communication between the rescue teams, the State Operation Centre and members of the talk group was done using the Kuala Lumpur Government Integrated Radio Network to ensure smooth information delivery during operation.

The search and rescue operation was implemented in two stages. First, the search for victims on the site and second, the extrication of victims trapped in the ruins of the collapsed building. Operations began with a briefing and risk assessment at the scene.

Techniques used in this operation includes to detect victims included using the specially trained dogs to seek victims in confine spaces and areas where it was difficult for the rescue team to enter the rescue team. The first dog performed an initial search for victims; a second was then brought in to verify if there was a victim of ruins at that location. No further victims were found.

Lessons Learned from the Incident

Operations at the collapsed building provided very useful and important experience and lesson learn for each member of the rescue team.

First, each member involved in the operation had the expertise, experience and skills and worked as a team and mutually helped each other. This was an important asset in the successful implementation of the operation. Each person involved understood his duties and responsibilities and his roles, without waiting for further instructions from superior officers. Enthusiasm, commitment and dedication of the team were all very high, which undoubtedly increased the performance of the department.

Second, in this particular operation, the team managed to achieve the target response time with distinction. The first team arrived with a recorded response time of ten minutes from a station where the expected response time was between ten and 20 minutes.

Third, the rescue teams carried out their search and rescue duty professionally, demonstrating a caring attitude and high commitment. This attributes are now being nurtured and strengthened among fire and rescue teams across the country so that the fire services nationally is seen as a highly respected global service.

Finally, coordination and understanding between the fire department and other agencies such as police, civil defence and the local authority was very good throughout the rescue operation. All the agencies demonstrated a high commitment and helped each other. They performed their respective roles based on expertise, experience and skill. Indeed, the strength of the teamwork between the various agencies was a major contributor towards the successful management and conclusion of the incident.

Conclusion

Search and rescue is one of the key roles of the Malaysia Fire and Rescue Department in the event of a disaster. Preparedness, skill, professional attitude and commitment of the rescue team are very important to ensure that every victim is rescued regardless of status, race or citizenship. Hence, each fire and rescue team member follows procedures and operational procedures set out in the directives, orders and regulations established under Malaysia's Fire Services Act 1983.

Fire team's success, along with other agencies in the operation, created a new image of the departments and undoubtedly boosted people's confidence regarding the government's commitment to protect the interests of society as a whole. Professionalism, the spirit of teamwork and the caring attitude shown among members of rescue teams has remarkably improved the fire and rescue department services in line with the slogan of 'Fast and Friendly'. Experiences and lessons from this type of operation has also increased self-motivation and a drive to achieve the highest possible effectiveness, along with the vision of the Fire and Rescue Department of Malaysia to become international class fire and rescue organisation. **APF**

Jupiri Apou is a Fire Superintendent with the Fire and Rescue Operations Division, Fire and Rescue Department of Malaysia

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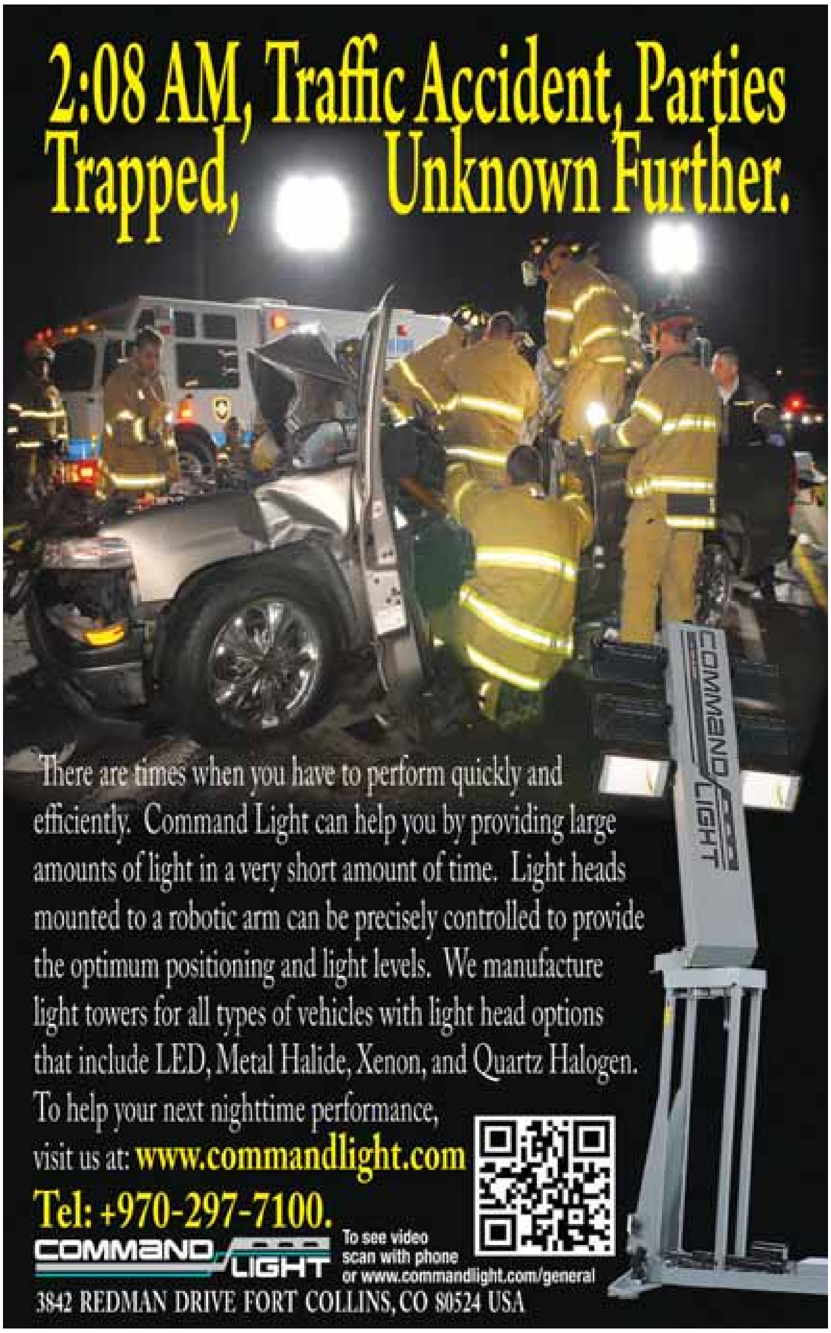
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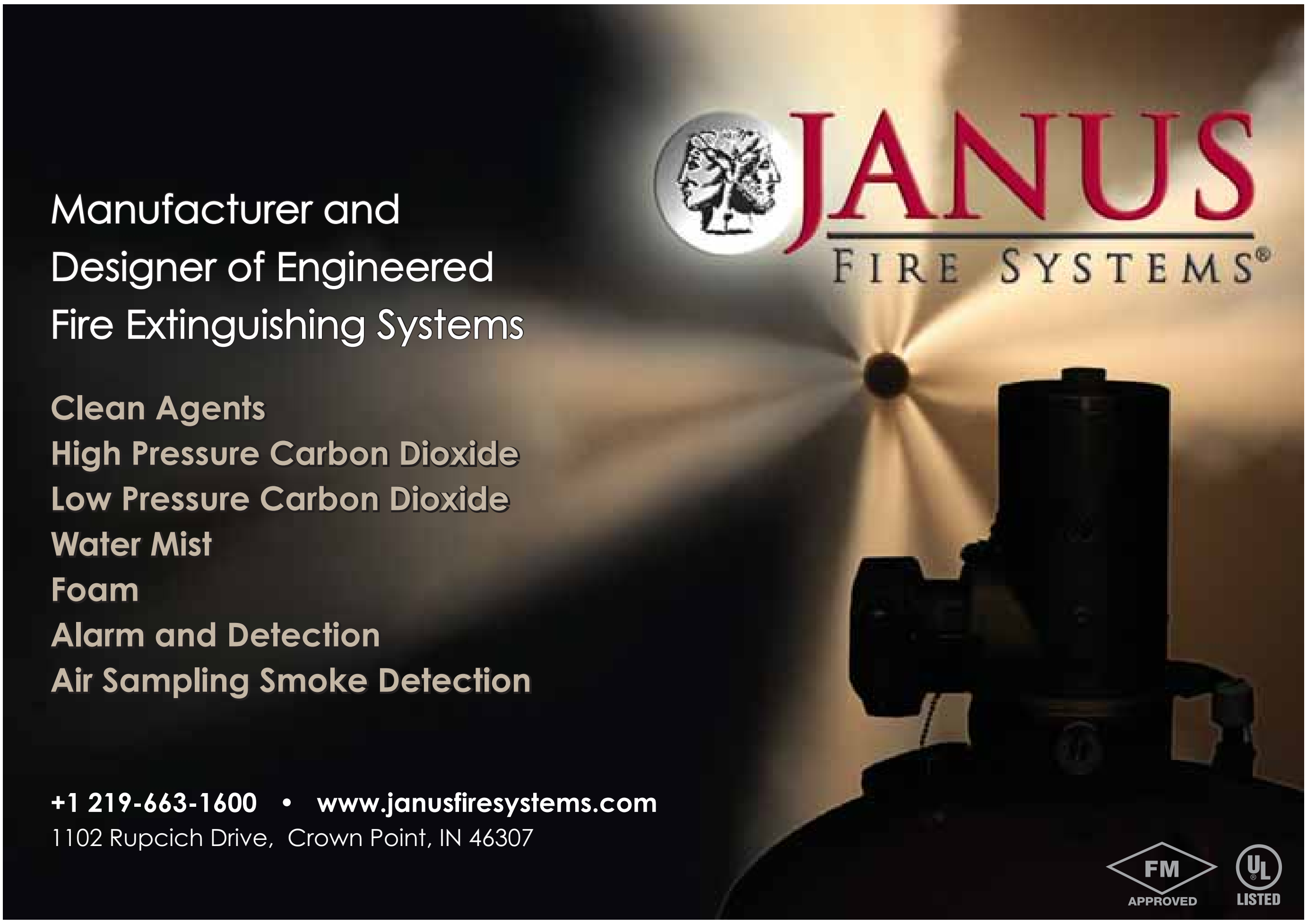

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Structural Fire Engineering & Optimisation of Fire Protection

Allan Jowsey

International Paint

Structural fire engineering can bring many advantages to a project including reduced fire resistance ratings and optimised fire protection requirements. Understanding its application together with characteristics of a passive fire protection material can bring cost savings to a project, while maintaining a safe and robust structural design.

Structural codes and guidance documents around the world cover the design of steel structures in fire. Those who use these codes have the opportunity to exploit the properties of structural steel to its maximum capacity in the fire limit state. When used effectively there can be significant benefits to the project, including robust and safe designs, quantified structural performance and cost savings.

The suitability of a member in a structural design is generally governed by serviceability limitations such as deflection. Generally this approach provides a conservative working stress for the steel sections of approximately 50 percent of their overall capacity. Within the UK, this simplified approach led to the development of generic limiting steel temperatures of 550°C for columns and 620°C for beams.

Best-practice industry guidance advises designers to specify a limiting steel temperature together with the fire resistance period as part of the overall steelwork specification. In reality, passive fire protection is generally specified post design-stage at a contractor or applicator level and sometimes very little is known about the limiting steel temperature.

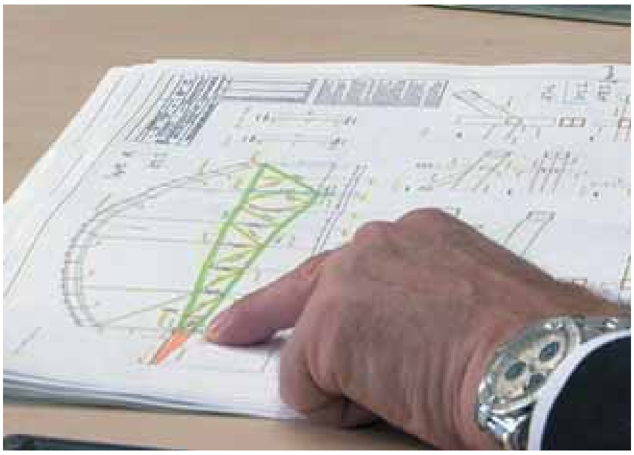
Steel as a Construction Material

Steel is used across many iconic buildings around the globe as the basis of the structural frame or to define certain features. Passive fire protection to steelwork is a very important safety element of any building. If not correctly specified it could have severe consequences in the event of a fire.

An increased understanding of how the performance of steel structures behave at elevated temperatures can provide safer solutions by understanding the steel failure temperature that is required for a given fire scenario by means of a structural assessment.

Steel at Elevated Temperatures

Structural steel starts to lose its yield strength at temperatures around 400°C and at 600°C at which point, approximately 50 percent of its yield



strength will be lost. In order to maintain stability, it is critical to ensure that structural members are fully protected against the high temperatures that are often generated in fires.

There is an increasing paradigm shift in the way of thinking by passive fire protection suppliers towards recognition of structural fire design approaches. Many structural engineers and fabricators are starting to collaborate closely with manufacturers in terms of product performance knowledge.

Many structural design codes and guidance documents include 'fire resistant' design. In the UK the relevant standard is BS 5950 Part 8:2003 and in Europe the relevant codes are EN 1993-1-2:2005 for steel and EN 1994-1-2:2005 for composite steel and concrete design. In BS 5950-8 and the Eurocodes methods are given for determining the thermal and mechanical response of the structure and evaluating the fire protection required, if any, to achieve the specified performance. An important feature of the standards is that they use the concept of a variable steel temperature, that is, the limiting steel temperature before the critical failure temperature is reached.

Defining a Fire Resistance Rating

Typically an architect would stipulate the fire resistance period in accordance with the building codes or regulations that prevail in the country or region where the building is to be constructed. There are a number of international fire safety codes and guidance documents currently in use, including the National Fire Protection Association (NFPA) suite of documents and the International Building Code and BS 9999.

These documents typically indicate a period of fire resistance for the building, which is generally determined based upon the height of the building, the occupancy use and the potential provision of a suppression system. The duration of a fire resistance period can be anywhere up to four hours depending on the associated risk.

In general, the standards do not specifically call for fire protection of individual structural elements, but they do stipulate that the building should remain stable for the fire resistance period. The stability of the structure acts primarily to protect life safety in terms of people to evacuate safely and for attending firefighters.

To realise the many benefits of the structural steel frame and to help maintain stability in the event of fire, it is often necessary to provide passive fire protection to some, or all, of the individual members that make up the steel frame. Unprotected steel can perform poorly in fully developed post-flashover compartment fires, which can lead to full or partial collapse.

Strictly speaking, a fire resistance period is only part of the fire resistance rating for structural steelwork. The performance criteria of a structural member should be defined not only by its fire resistance period, but also by its maximum allowable temperature at that period to maintain stability, termed the limiting steel temperature.

Typically to allow for the correct specification of the fire protection, the following minimum information is required:

- Fire test standard *e.g. EN 13381-8.*
- Fire resistance period *e.g. 90 minutes.*
- Structural section *e.g. I-column.*
- Degree of exposure *e.g. 4-sided.*
- Limiting steel temperature *e.g. 684°C.*

Load Ratio & Limiting Steel Temperatures

The limiting temperature method may be used to assess the structural stability in fire of members including columns and beams. The limiting temperature, which should not be exceeded during the required fire resistance period, is dependent upon a number of factors:

- The ratio of the load carried during the fire to the load capacity at ambient.
- The temperature gradient within the member.
- The dimensions of the section.
- The yield strength of the steel.

At ambient, structural design uses the concept of ultimate and serviceability limit states. Associated partial safety factors to represent these states are applied to the given loads acting on the structure. The resultant loads are used in a structural assessment to generate steel member sizes. At the fire limit state however, the partial safety factors may be different to those for ambient.

The resulting load in the fire limit state is effectively reduced to account for the probability that in the event of a fire the structure is unlikely to be loaded to its capacity and can be justified using statistical evidence of actual measured imposed floor loading. The ratio of the effective load applied on the member in the event of a fire to the load at ambient is termed the 'load ratio'.

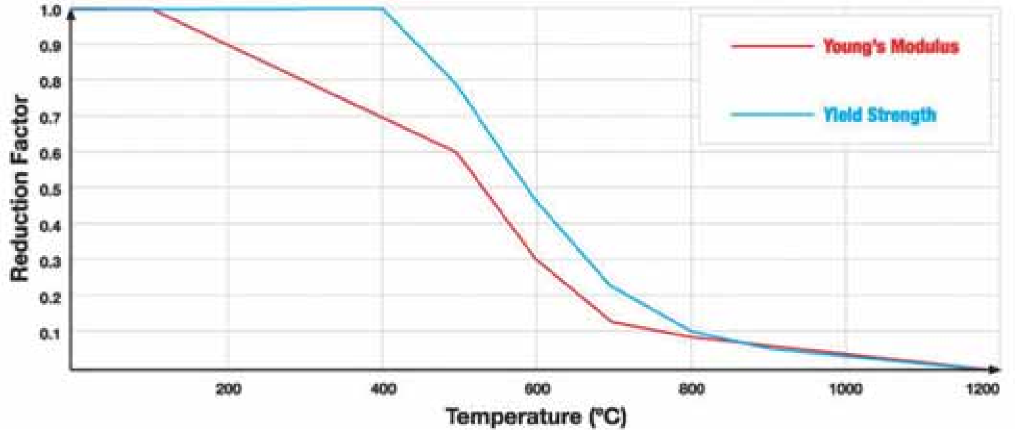
Both BS 5950-8 and the Eurocodes use the concept of load ratio as a measure of the applied load that a member can resist at the time of a fire. In practical designs, the load ratio may vary from 0.45 to 0.55. However it is not uncommon for designs to have a load ratio greater than or less than these values. For a given load ratio, the maximum permitted temperature is termed the limiting temperature. In essence, the steel member will function satisfactorily at the limiting temperature but will fail at higher temperatures.

Lookup tables are defined in BS 5950-8 and EN 1993-1-2 to define the limiting steel temperature for a range of different member types for a range of load ratios.

Industry Temperatures

In the absence of an appraisal of a member's limiting temperature, the UK passive fire protection

STRUCTURAL STEEL PROTECTION



industry has adopted limiting temperatures as follows:

- 550°C for typical columns in compression.
- 620°C for non-composite beams supporting concrete slabs or composite slabs.
- 520°C for hollow sections.

Industry prescriptive temperatures vary across the world in accordance with relevant legislation. For example, UL 263/ASTM E-119 uses a maximum limiting steel temperature of 538°C for columns and 593°C for beams; in parts of Europe, the temperature is commonly 500°C and in China the concept of limiting steel temperature does not exist – this is in place of a single protection thickness to cover all steelwork. In the offshore industry, Classification Societies typically set a limiting steel temperature of 400°C.

The Steel Construction Institute (SCI) in the UK has acknowledged that the temperatures of 550°C and 620°C are acceptable for most circumstances but not always.

In the case of cellular beams, then the above generic temperatures are not applicable due to the fact these beams have additional failure mechanisms as a result of their openings which need to be accounted for. As such, there are no generic temperatures for these beams and their limiting steel temperature must be determined based on a thermal and structural assessment.

Performance-based Design Approach

There are number of approaches available to designer's to establish a limiting steel temperature. These can range from an assessment of the load ratio and simple lookup temperature, to single element checks through to whole frame assessments including advanced finite element methods to account for restrained thermal expansion and load paths within the structure. Often, the greater the level of complexity and interaction consideration, the greater the potential to increase the limiting temperature and make reductions in the passive fire protection costs.

The appraisal of the limiting temperature for structural elements is an exercise that is best carried out once the structural design has been finalised as the section sizes may still be subject to modification at various stages throughout the design, including at a steelwork fabricator level.

A common method of assessment is to assess the degree of utilisation of a structural member in the fire limit state through a single element analysis. This approach considers beams or columns in isolation with conservative boundary support conditions and effectively reproduces the load-bearing scenario of a standard fire test as close as possible by calculation.

Manufacturers of passive fire protection subject their products to a fire test package that comprises unloaded and loaded beams and columns at minimum and maximum product thicknesses. In the UK and Europe, the result of this test package is a dataset that defines the required protection thickness for structural sections over a range of limiting steel temperatures, typically 350°C to 700°C in 50°C intervals. Certified product listings available in the public domain, typically only show the thickness of material required to satisfy the accepted industry standard temperatures. Manufacturers may not typically publish their product-specific multi-temperature assessment (MTA) thicknesses. It is therefore in the interest of engineers concerned with defining limiting steel temperatures for the purpose of setting steelwork specifications to coordinate closely with passive fire protection suppliers to ensure that the potential benefits are understood.

Summary

The use of structural fire engineering techniques to calculate a structural member's limiting steel temperature can result in savings of the required volume for fire protection material for a given project. In the intumescent coating industry this can have further benefits by reducing the dry film thickness required on each member which in turn requires fewer coating applications. This can bring significant time savings to construction schedules and labour costs.

While the use of generic limiting steel temperatures in the absence of a structural assessment may in the majority of cases be conservative, this may lead to an over-application of passive fire protection. It is also acknowledged that in some cases they may not always be conservative, leading to an under-application of fire protection.

Given that the methodologies exist in the design codes to undertake a structural assessment to determine the limiting temperature, qualified engineers within the contract chain should be encouraged to evaluate steel temperatures and to work closely with passive fire protection manufactures to realise the benefits it can bring. Rather than assuming performance criteria, setting steelwork specifications for fire protection in this way can assist to inform robust design based on quantified structural assessment. APF

Dr Allan Jowsey is Fire Engineering Manager for International Paint

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Are "Ex Certifications" to be trusted?

Urs Baeumle

Permalight (Asia)

In April this year, a third party commissioned DEKRA Certification B.V in the Netherlands to test six brands of 'intrinsically safe' alkaline (4 x AA) powered hand lamps and to validate not only various performance claims but also to verify if the lights were compliant with the issued ATEX certifications. The results of the study –"Photometric and mechanical testing of six different type of professional torches" – are a cause of concern.

In brief, the DEKRA test report documented that five of six flashlight samples did not live up to some of the performance claims. For example, grossly overstating lumen ratings, and three samples failed the immersion tests as water leaked into the battery chamber, in non-compliance with the issued ATEX certifications and IP ratings.

What is Intrinsic Safety?

To cause an explosion three elements must be present: Oxygen, flammable compounds and a spark or a flame. As general definition, equipment termed as 'Intrinsically Safe' is incapable of causing electrical sparks or sufficient thermal energy to ignite flammable compounds present in an explosive atmosphere, may they be gases, vapours or dust.

In battery-powered luminaries, three main components might cause a spark or a flame:

- Batteries might leak, gas out or short-circuit.
- Light source – incandescent bulb might break or explode; LED circuits can short-circuit and components may overheat or become faulty.
- Enclosure and material – electrostatic discharge can cause sparks.

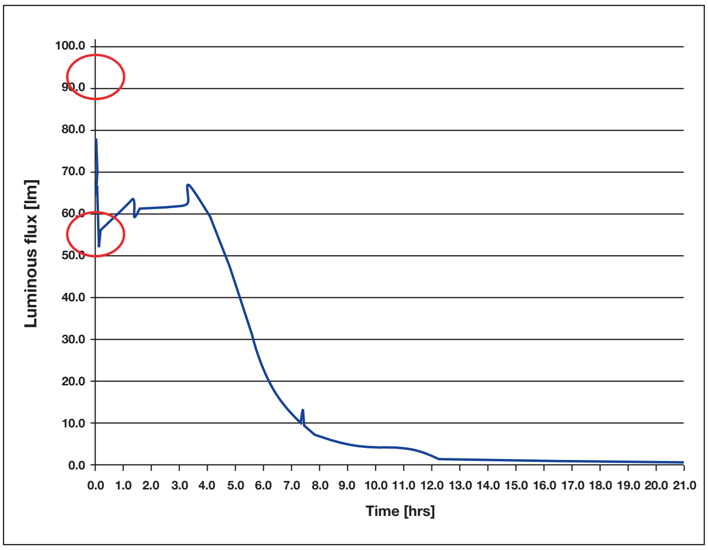
Batteries

Handheld flashlights and headlamps require a power source to operate; these can be rechargeable or non-rechargeable battery cells, for example Li-ion, NiMH, NiCd, alkaline or lithium. Batteries store energy to be released as 'electrical power', and depending on the chemistry, some batteries are more energetic than others.

Yet, batteries may leak over time, gas out or short-circuit damaging the electronics and the enclosure of the luminary. Gassing batteries are of special concern as there are risks that they might explode inside the compartment leading to injuries or, in the worst case, initiating a major explosion. 'Safety gas valves' seem not to offer much protection when batteries start gassing.

Light Source

As light sources, most handheld flashlights and headlamps use either incandescent bulbs such as Xenon, Krypton, or LEDs. Obviously, light bulbs can burnout or break when lit. Also, light bulbs will become very hot during operation – the brighter the hotter – heating up the luminary enclosure (and batteries), sometimes to critical



The graph shows the light performance using a direct driven LED circuit

temperatures sufficient to ignite flammable gases or dust. Therefore, light bulbs have to pass electrical and the housings mechanical and environmental stress tests before the light will be certified as 'Intrinsically Safe'.

Where luminaries include an LED light source, it is mostly ignored that LED chips not only generate considerable heat, they require an electrical circuit and a heat-sink to operate. The Achilles tendon of all LEDs is the electrical circuit that must be designed and manufactured in accordance to approved safety norms and standards in order that neither the circuit nor any of its components will short-circuit and cause electrical sparks.

Circuits

Incandescent light bulbs can be directly connected to batteries without having to take polarity into consideration. Therefore, the electrical circuit is rudimentary, consisting of a bulb, batteries, contacts and likely a switch.

LED emitters are diodes allowing the current to flow in one direction only. In a very simple circuit, LEDs are direct driven, similar to a light bulb. Alternatively and more expensive is to drive the LED with a regulated circuitry. But which of the two is more efficient and safer? Performance wise, the LED with the regulated circuit will fare better than if direct driven; however, electrical safety can only be guaranteed if the regulated circuit includes current limiting resistors, a fuse, and is reverse polarity protected. In addition, all components that might heat up must be insulated, creepage between conductive tracks must be avoided and clean and solid soldering is a prerogative.

Considering the above two circuit types, it is important for the user to know:

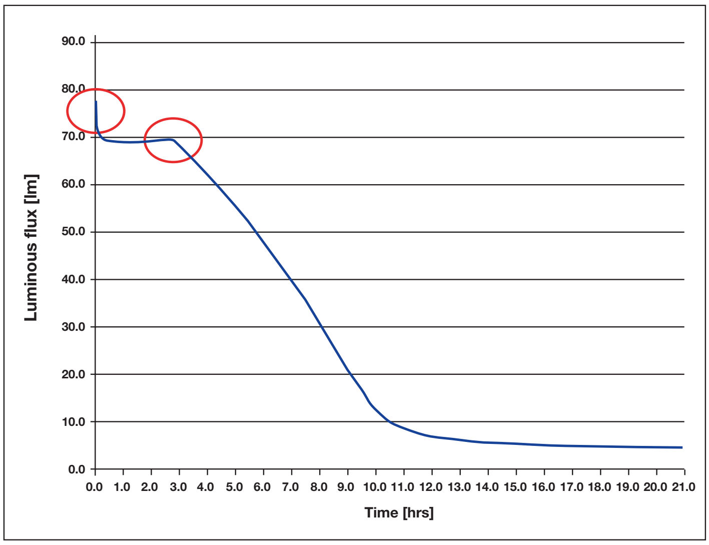
Direct-driven LEDs are connected directly to the batteries and will be very bright in the first few minutes but then lose rapidly around 50 percent of the light power. The graph shows the drastic drop in luminous flux from 96 lumens to 53 lumens within a few minutes (it is worth noting that the DEKRA-tested sample is advertised as emitting "200 lumens"). For cost considerations and simplicity of engineering, the majority of "intrinsically safe" lights rely on direct driven LED circuits.

IC-controlled LED circuits regulate the current supply either by pulse modulation (PWM), constant current (CC) or alternatively by applying constant voltage (CV); in other words, a microcontroller constantly senses and optimises the forward current respectively forward voltage applied to the LED, keeping the light output constant and so reducing negative thermal effects. The conclusion is that IC controlled LEDs are safer and show a far better performance than direct driven LEDs.

Enclosures

Enclosures of intrinsically safe lights are predominantly made of plastics; these might have conductive or non-conductive properties. Non-conductive polycarbonate (PC), for example, Lexan, is the most common and cost effective plastic. Conductive anti-static materials like carbon fibres and "XAG" are expensive and preferred if lights are to be certified for safe use in highly explosive atmospheres, such as those with Nitrogen gas. Before a flashlight can be certified as 'Intrinsically Safe', the entire enclosure has to pass various laboratory tests that include impact and drop tests, water and dust immersion (IP rating) and, depending on certification, temperature stress and electrical resistivity tests.

IP ratings indicate the level to which the flashlight is water and dust proof. Water immersion is part of the 'product certification tests'. After the tests, the product will be IP rated, such as IP 67



The graph shows the light performance with a safe IC controlled LED circuit

or IP 68. For example, IP 67 certifies that the product is "Dust Tight" and suitable for "Immersion up to one metre". In the mentioned DEKRA report, three out of the six flashlights failed this one-metre immersion test, despite two vendors are claiming that the affected models are "suitable for diving".

Norms, Certifications & Inconsistencies

The above comments refer predominantly to ATEX, which stands for "Appareils destinés à être utilisés en ATmosphères EXplosives"; ATEX applies mainly to the European Community. However, countries, such as the US, Canada, Australia, Russia and Japan all implement different directives – UL, FM, ETL, IECEx, TIIS, to mention a few. It is outside the scope of this paper to explain the nuances and differences of these directives other than to state that the general product test methods follow and apply schedules similar to ATEX. In accordance to the various certification schemes, 'Intrinsically Safe' products can only be distributed if the facilities of the certified vendor are audited by a Notified Body.

However, vendors that market "Ex certified" lights under their own brand may not necessarily be the original manufacturer, instead employing uncertified subcontractors in third countries. Most subcontractors do not have any 'Ex' quality assurance module in place and the production facilities are not inspected and audited by any Notified Body. In other words, US or European vendors may purchase flashlights either as "complete knocked down" (CKD) kits or as finished products from unnamed and uncertified subcontractors located in different jurisdictions.

In case of CKD kits, the vendor assembles the parts at his facility and sells the products as "intrinsically safe lights" under his own brand certified by a Notified Body in his name. On the other side of the coin, customers purchase, in good faith, a 'branded and Ex certified' flashlight or headlamp that might turn out to be unsafe if used in hazardous areas. For example, an unnamed European "Ex safety" company markets an alkaline battery powered headlamp certified to ATEX "II 2 G Ex ia T4"; "ia" approves the lamp for Gas Zone 0, an area in which explosive gases are continuously present. However, the LED board is made by an "Ex" uncertified subcontractor. The circuit does not include any current limiting resistors or a fuse, components are without insulation and conductive tracks are closer than permitted risking certain current creepage. And yet, the head lamp was approved and certified by a Notified Body in Germany.

Conclusion

The previously mentioned DEKRA report and the cited examples should sound alarm bells to users who operate luminaries in hazardous areas. Flashlights and headlamps branded with Ex certifications are no guarantee that the lights will perform as advertised or will be truly safe for deployment in potentially explosive atmospheres! The reasons are:

- **Notified Body**

To be certified as 'Intrinsically Safe', products must comply with specific norms and standards such as ATEX; nevertheless, it is left to the interpretation of the Notified Body how to implement these. For safety reasons, and in order to avoid ambiguity, it should be made mandatory that only products can be called and marketed as 'Intrinsically Safe' if the entire production chain, including the vendor and the main subcontractor that supplies electronic boards and LED modules, is audited and certified by a Notified Body.

- **Certifications Definitions**

The various definitions, nomenclature and letterings classifying intrinsically safe products are confusing to most users. As example, US and European norms apply different criteria: "classes" versus "zones".

- **Vendors**

For marketing purpose some vendors tend to overemphasise product performance. To be competitive and/or lack of electronic engineering, many 'Ex certified' vendors purchase electronics modules, such as complete LED assemblies or even the entire product, from 'Ex' uncertified subcontractors without having direct control over production, product quality and safety.

- **Users**

Price driven, many customers put a lower priority on safety', as long as the product is branded and carries some kind of 'Ex' certification. However, users are well advised to select only 'Ex' luminaries that are certified by two different organisations such as ATEX and IECEx.

- **Legal Implications**

In the event that an 'Ex' certified luminary causing an accident, fire or an explosion, the above comments lead to the conclusion that the user will, at the end, bear all responsibilities and liabilities. One of the many legal but not hypothetical questions is what will happen if a Notified Body has its accreditation suspended or revoked? Will the products certified by this very organisation have the 'Ex certifications' invalidated so that the products cannot be distributed any longer as "intrinsically safe" luminaries? The answer remains open. APF

Urs Baeumle is Managing Director of Permalight (Asia)

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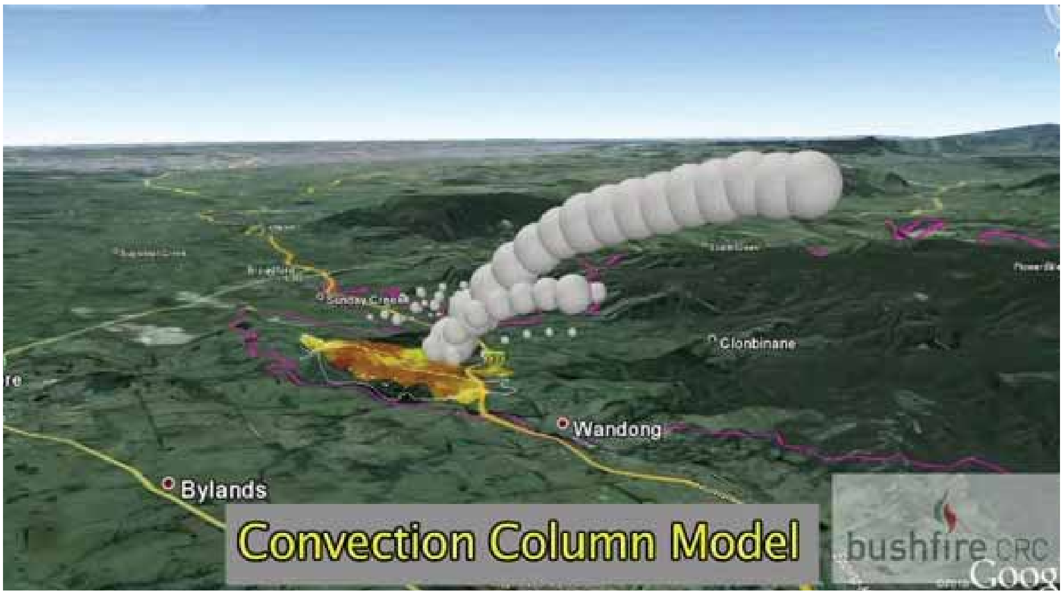


Toolbox Talk

Bob Cechet

Bushfire CRC and
GeoScience Australia

Imagine you are an incident controller sitting in front of a computer screen that is showing you where a fire that has just started is likely to head. Not just that, but also the houses and other structures in the fire's path, and even the number and type of people living in the area – children, adults, and the elderly. In addition, imagine that you can quantify the uncertainty in both the weather affecting the fire, and also the state of the vegetation in the area, so as to deliver a range of options relating to the expected spread of the fire.

Think of the advantages of such a program in making speedy, well-informed decisions about where best to send fire trucks and fire-suppression aircraft; in being able to issue timely, locality-specific warning messages; in judging whether this fire will become so bad that it might warrant recommending not only an early, orderly evacuation of communities in its way, but also identifying the least risky roads for people to get to safety.

A computer program that will not only be able to help with all this and more in a fire, but will also be capable of determining what structures, streets and communities would be at risk should a fire occur, will enable those at risk to undertake remedial work around their properties in advance to make them more fire-ready.

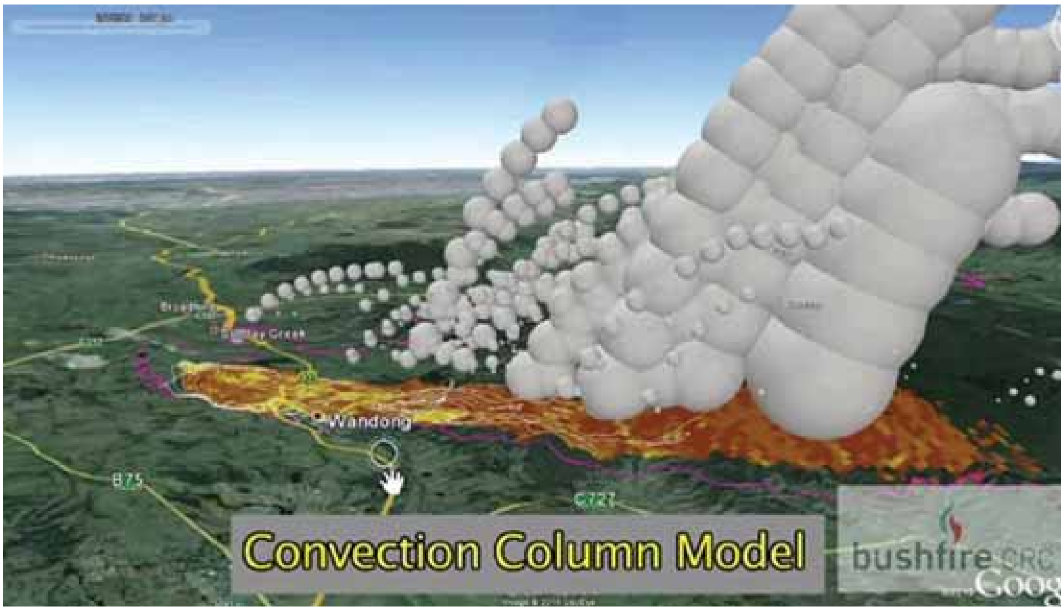
While such a program will not be ready this year or next, it is under development by collaborating teams of the Bushfire Cooperative Research Centre (CRC); researchers from Geoscience Australia, the University of Melbourne, the Bureau of Meteorology and two divisions of the CSIRO. It has the working name *Fire Impact and Risk Evaluation Decision Support Toolbox*, and is one of the Bushfire CRC extension's biggest projects. It links various models and projects developed during the first seven years of the Bushfire CRC, including the Phoenix RapidFire fire prediction model developed by the University of Melbourne's Dr Kevin Tolhurst.

The work of the 2009 Victorian Bushfires Royal Commission (VBRC) highlighted a need for a tool to assess the potential bushfire impacts on rural and rural-urban interface communities responding to an immediate threat, but also to examine scenarios that may pose a threat in the future. Twenty-five recommendations from the VBRC report involved assessing or reducing risk.

When fully developed, the Toolbox will enable fire and land management authorities to develop appropriate fire impact and risk treatment options at local, regional and national levels. This will be achieved by building a library of possible or credible fire impact scenarios, based on historical weather conditions surrounding severe fires, as well as information about the vegetation in certain areas, including the type, the amount and its moisture content.

Phoenix RapidFire will be the Toolbox's engine. Phoenix RapidFire uses geographic and weather information to predict where a fire will go. It is now being used operationally in Victoria and under formal evaluation in New South Wales and South Australia. Dr Tolhurst says that reported Victorian fires are automatically simulated in Phoenix RapidFire to see their potential spread over six hours and the potential assets that might be affected. Additionally, a grid of ignitions across the whole state is run every morning to identify the areas most at risk from fire that day.

"We aim to improve the feed of meteorological data including the development of a third vertical dimension depicting convection, to enable Phoenix



RapidFire to accurately simulate fire-spotting ember attack ahead of the main fire front," says Dr Tolhurst. "In addition, we are also planning to implement a more realistic fire suppression model to capture the ways in which resources are allocated to different sectors of a fire. The resulting fire-spread outcomes will be used by the advanced vulnerability and impact modules within the Fire Toolbox to evaluate realistic impacts such as damage and costs, which can be used to inform cost-benefit analyses for a range of land management options."

The Toolbox is expected to add substantially more information about weather, geography, structures, population and fire behaviour to the already advanced technology of Phoenix RapidFire.

The *Fire Impact and Risk Evaluation Decision Support Toolbox* is expected to add substantially more information about weather, geography, structures, population and fire behaviour to the already advanced technology of Phoenix RapidFire.

David Youssef, Deputy Chief Officer of Melbourne's Metropolitan Fire and Emergency Services Board (MFB) and one of two lead end users for the project, says the project is about assisting incident controllers in difficult situations, providing a product that is genuinely useful to them and the community. "It will be a tool to allow incident management teams to tell communities where their vulnerabilities are," he says. "I believe the technology will be able to show even how a fire will impact on structures in a particular street. It will add much better information on, and give an incident controller much better information on, what structures are in a community and the demographics of the people living there."

Ian French of Geoscience Australia is bringing various databases and models together into an integrated simulation framework through a geographical information system (GIS) interface. The data includes vegetation, terrain, topography and weather as well as people, buildings and infrastructure. Pre-processed information, such as factors that determine the local and regional wind, and also the typical response of buildings to fire, will be linked with the buildings in the database, along with census-derived social and economic information.

"Large bushfires are complex and unpredictable," says Mr French. "They are greatly influenced by variations in wind and temperature, terrain and vegetation. By varying the circumstances surrounding bushfires and modelling the likely impacts, the Toolbox will have the ability to run a large range of bushfire scenarios, ranging from inconsequential to catastrophic, which will inform the long-term fire risk for communities and be able to provide the bounds of possible consequences for a particular event."

Dr Jeff Kepert of the Bureau of Meteorology says the Bureau's new computer-based weather prediction system, ACCESS, uses better technology than its predecessor and is much more accurate and reliable. "Within the Fire Toolbox we have configured ACCESS for very high resolution simulations, and applying it to severe fire weather conditions in rugged terrain. Modelling at this scale will really stretch the computers but is necessary to be able to understand the complex winds, temperatures and humidity that occur during events like Black Saturday. Once we have validated the modelled weather against case study observations, our partners in this project will use it as an input to their fire behaviour models – the aim here is to directly predict the spread, intensity and impact of a fire. We also plan to look at some alternate scenarios, such as what if the wind change arrived an hour earlier or later, or the wind speed was more or less than predicted."

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Justin Leonard of CSIRO Ecosystem Science has undertaken considerable research for the Bushfire CRC into the effects of fire on structures such as homes, fences and water tanks, seeking to understand how the physical attributes of buildings interact with their surroundings during bushfires. This work is now being expanded to form part of the Toolbox project.

Large bushfires are complex and unpredictable. They are greatly influenced by variations in wind and temperature, terrain and vegetation. By varying the circumstances surrounding bushfires and modelling the likely impacts, the Toolbox will have the ability to run a large range of bushfire scenarios.

"We plan to characterise the behaviour of vegetative and non-vegetative elements found within the rural-urban interface zone," he says. "The research focus will be to provide consistent parameters that adequately describe the element properties and spatial relationship with their surroundings, so that simulations of the physical process that occurs during bushfire events can be performed."

The simulations will be validated against actual events and used to profile the vulnerability of existing and future rural-urban interfaces. The simulations will be performed on various two-dimension and three-dimension interface scenes using spatial data: mainly aerial photography and LiDAR (aerial laser scanning).

"We will address the need to combine the broader fuel definition used in bushfire behaviour prediction with the very detailed fuel definition used in house damage and loss research, to come up with a system of defining fuels in rural-urban interface areas that are useful for contributing to the prediction of house loss," Mr Leonard added.

Another thread to the Toolbox is the effect of smoke and heat on people. Dr Mick Meyer of the CSIRO Marine and Atmospheric Research is investigating the impacts of the fire's plume on regional health from severe bushfires and prescribed burning programs, as well as the risk of reduced visibility caused by ground-level smoke. His work

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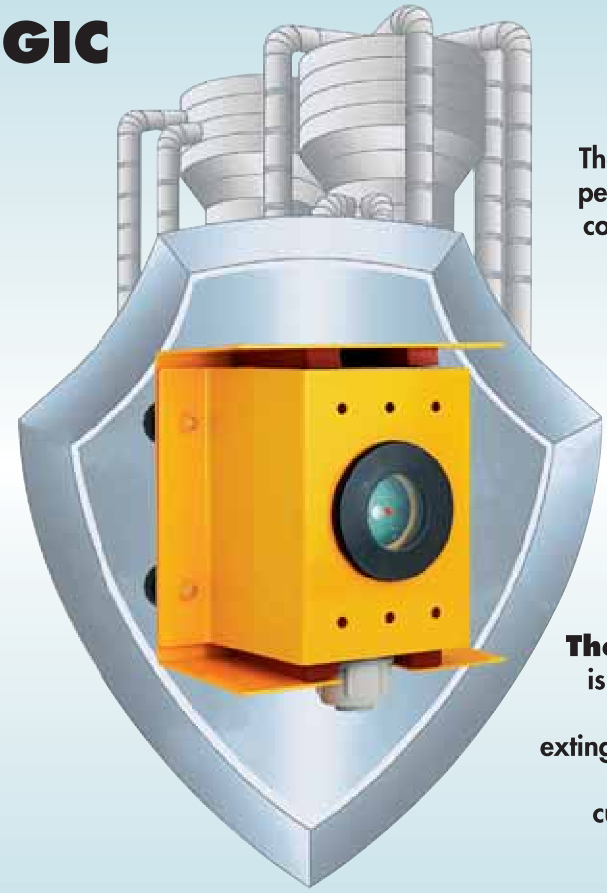

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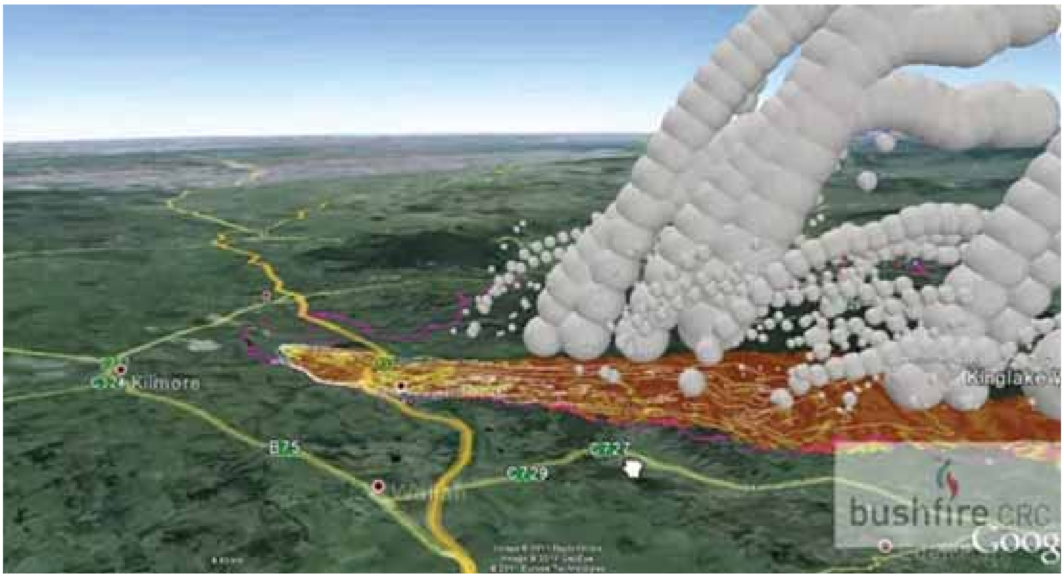

involves the development of spatial smoke and chemical emissions estimates for major and extensive fire events in southern Australia, and the application of these estimates to several atmospheric transport models to predict tracer concentrations and surface impacts.

"Through comparison of the predictions against observations, we plan to assess the sensitivity of the predictions to parameter values in the emissions model," says Dr Meyer. "We think that the most significant areas of uncertainty will be plume rise and the dependence of emission factors on combustion properties."

Dr Meyer is working with the Bushfire CRC fire behaviour project led by the CSIRO's Dr Andrew Sullivan, undertaking experimental burns in the CSIRO Pyrotron, a fire wind tunnel used to measure emission factors for methane, nitrous oxide, particulates and relevant air toxins covering a range of fuels and fire intensities.

> **All these strands of the Toolbox project need to be brought together in a single prototype working model in the second half of 2013. The work is so technologically ahead of almost anything else like it that the computer power to make it work in real time is not yet available.**

All these strands of the Toolbox project need to be brought together in a single prototype working model in the second half of 2013. The work is so technologically ahead of almost anything else like it that the computer power to make it work in real time is not yet available, but the expectation is that this will be overcome as computer speeds and technology continue their rapid evolution.

It could be some years before computers are powerful enough to perform the full range of simulations in both high-resolution and in near real time. In the meantime the focus will be on building up the underpinning datasets over large regions of Australia, while using available data and simulations to better understand and interpret the impact and risk to people and buildings in a limited range of case study regions.

The focus of this current project is to construct, develop and validate a prototype bushfire simulation system with the long-term aim to create a fully operational tool in association with the project's end user advisory group. The immediate research and development focus is on the estimation of the consequences of extreme fires based on the characteristics of vegetation, extreme fire weather, fire-spread, heat stress and smoke production and dispersion, considering three case study scenarios.

The next step will be evaluation by end users, including land management and fire agencies. Following acceptance by agencies, it is planned to implement robust computer software and hardware practices with the aim to make the Toolbox operational so that it can address potential bushfire response in near real-time.

The MFB's David Youssef is confident the project will produce a model to run as a trial. "Fire managers need to make quick decisions under extremely complex conditions," he says. "They need to know where to direct firefighting resources and how best to protect the community. As more people move into the rural-urban interface, we need to continually update the way we approach fire safety. The Toolbox will allow us to keep our communities safer. The success of the planned research is likely to trigger the development of an operational tool and a roll-out of the Fire Decision Support Toolbox to Australian fire and emergency service agencies." A short video about the research and what it means for the future of fire management is available on the Bushfire CRC website. APF

Bob Cechet is Bushfire CRC Project Leader and Climatologist GeoScience Australia

For further information, go to www.bushfirecrc.com/category/projectgroup/2-risk-assessment-and-decision-making

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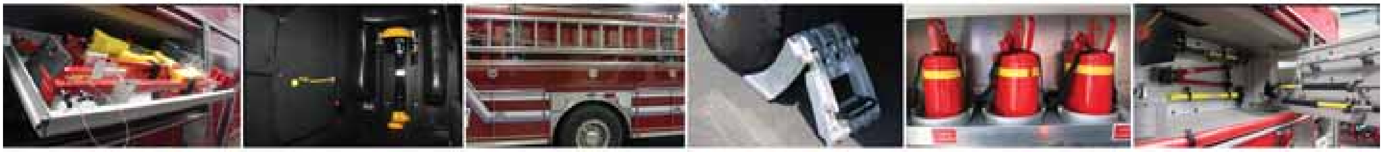

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FOREMOST MARKETING PVT LTD

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PT INSPIRAN IDEAL INDOTAMA

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SEA AIR THAI CO LTD

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Website: www.askagroup.com
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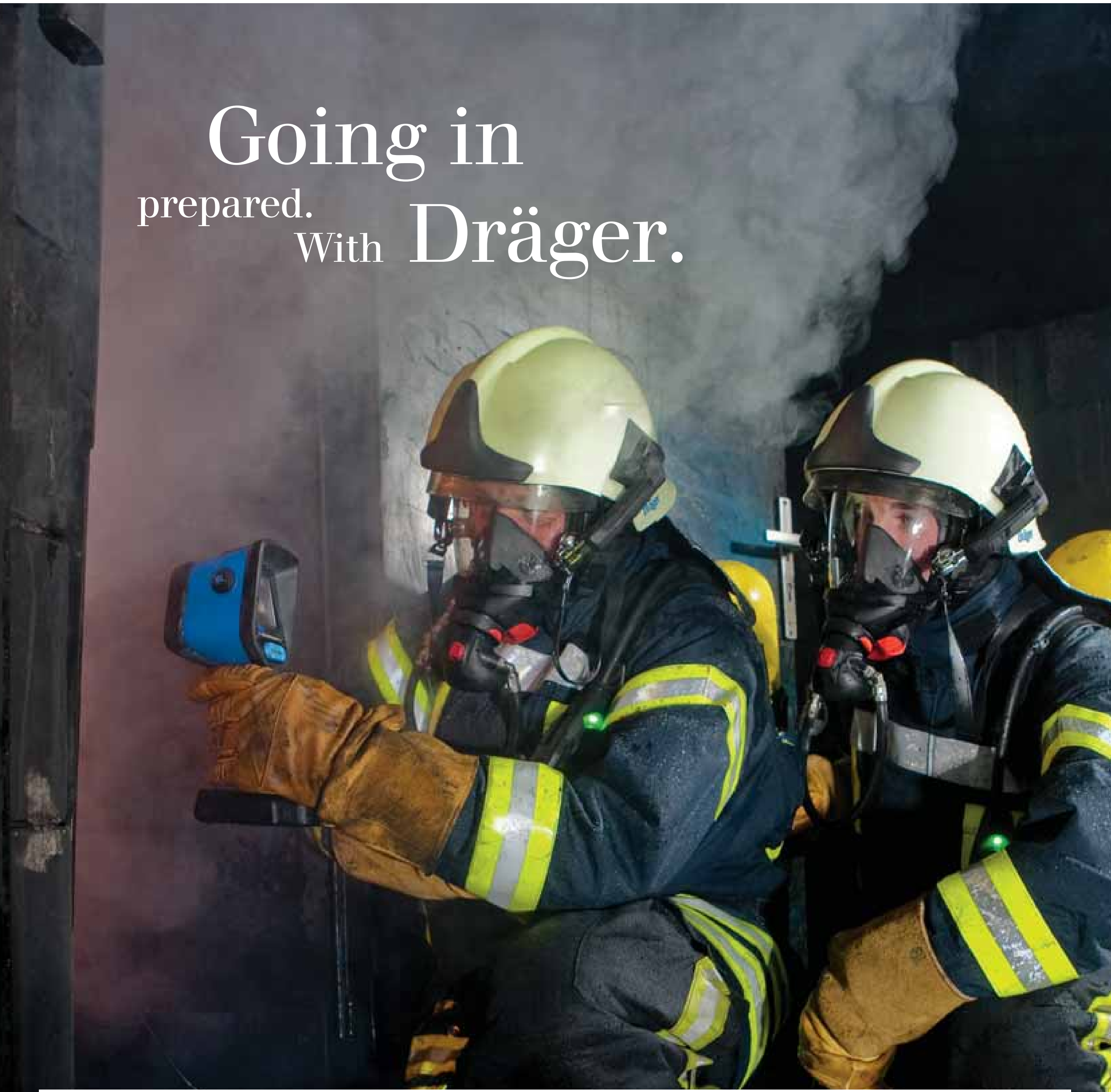

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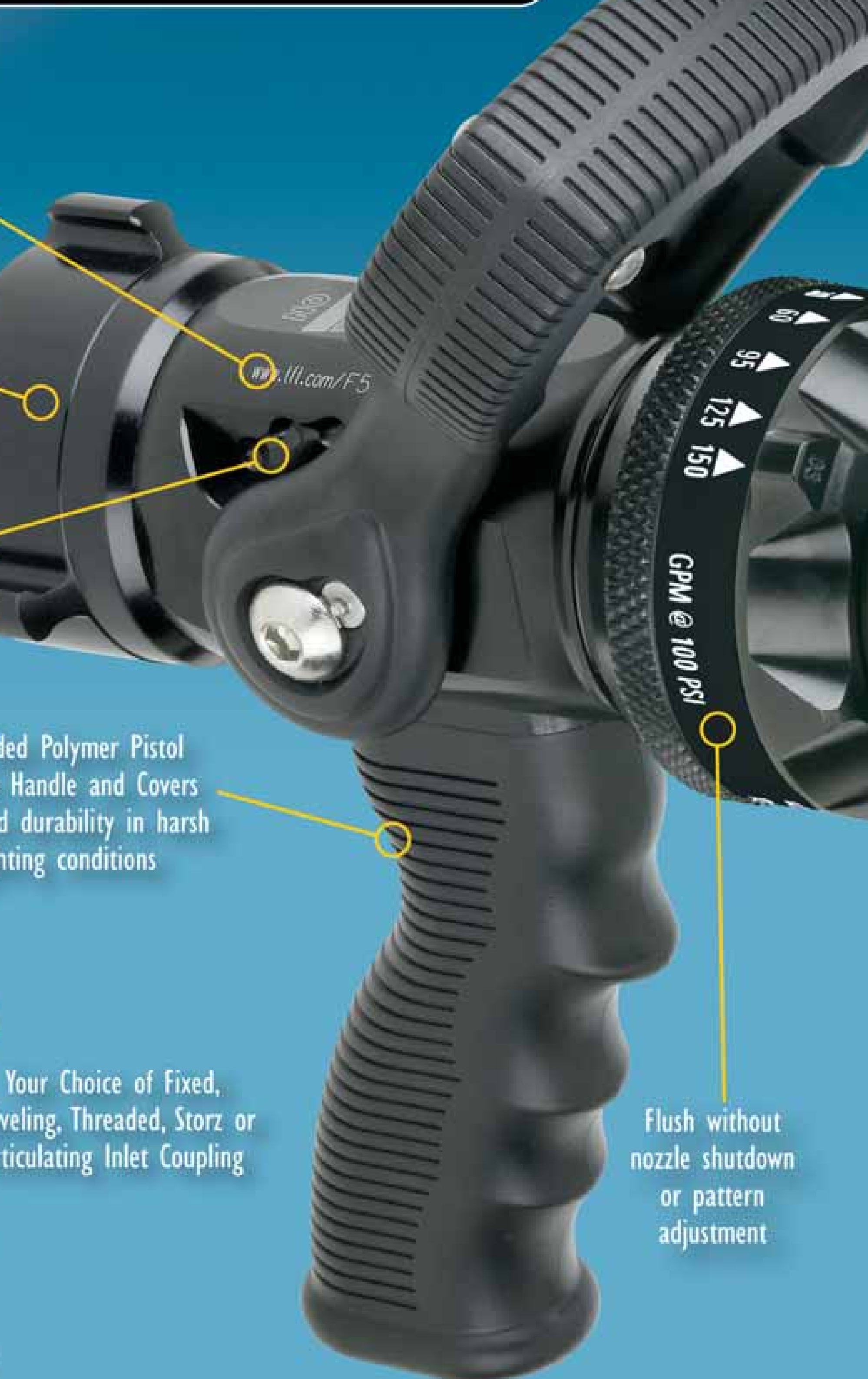

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ASIA PACIFIC FIRE MAGAZINE
REPORTING TO THE ASIA PACIFIC FIRE PROTECTION AND FIRE SERVICE INDUSTRY

Asia Pacific Fire's editor witnessed a hangar fire protection system at Brisbane Airport – a "first" in Australia – that may become the aviation industry's preferred solution

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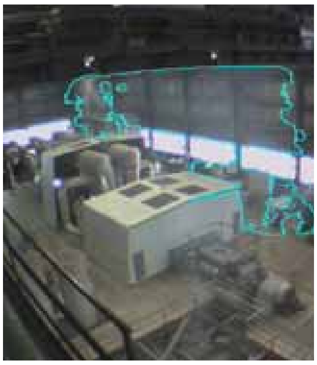

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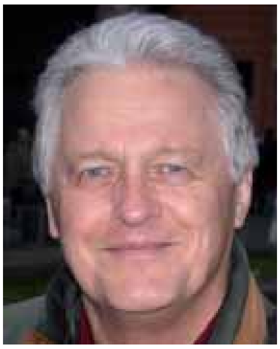

By Graham Collins

Hearing & Listening

If you think there is a difference between hearing and listening, you are right. There is. Hearing is simply the act of perceiving sound by the ear; unless you are hearing-impaired, hearing simply happens. Listening, however, is very different; it is something you consciously choose to do, requiring concentration so that your brain processes meaning from words and sentences. It is listening that leads to learning, and learning that can lead to action.

You may, perhaps understandably, be wondering what the significance is to those involved in firefighting and rescue? Well, two recent examples of hearing rather than listening might help to explain.

Go back 18 months or so to the earthquake and tsunami in northern Japan and the nuclear disaster that devastated the country and from which it is still striving to recover. It now transpires, according to the findings of the Fukushima Nuclear Accident Independent Investigation Commission, that the operator of the nuclear power plant that suffered the tsunami-induced meltdown has admitted that the disaster could have been avoided. The sea wall that was meant to protect the plant from tsunamis was not high enough, despite repeated requests by safety inspectors that it be raised. In short, the plant's operator heard the warnings from the inspectors, but failed to listen to them.

Now step back a few months earlier to the Pike River Mine disaster in New Zealand's South Island. The Royal Commission on the Pike River Coal Mine Tragedy issued its report recently that apparently concluded that before an underground explosion killed 29 workers two years ago, the now-defunct Pike River Coal company ignored no fewer than 21 warnings that methane gas had accumulated to explosive levels, and another 27 warnings of it reaching dangerous levels. Tragically, the warnings continued right up until the morning of the deadly explosion. Did the company's management hear the warnings? Of course they did. But did they listen? Obviously not.

In both of these devastating cases, those responsible were not hard of hearing, they were hard of listening. They chose – no doubt for financial reasons – not to listen or take heed of the professional safety advice they were being given; and given it surely was in both instances, time and again.

Now, before we jump to the conclusion that these lessons have been learnt and that these disasters will never be repeated, it is wise to remember that just about every economy has tightened its purse strings or is in the process of doing so. The natural consequence of this can so easily be that safety is nudged down the agenda to a dangerously low position beneath financial concerns. Across the Asia Pacific region – indeed throughout the world – it is all too easy to find examples of underfunded fire and rescue services, inadequately equipped personnel and poorly enforced fire safety standards, codes and regulations.

There is no dodging the fact, of course, that money has to be found from somewhere to pay for training, equipment and manpower, but this should always be undertaken bearing in mind the need to maintain, if not raise, safety standards, and the potential consequences of failing to listen to those with front-line experience.

It is not uncommon to hear that those allocating the funds have had "meaningful discussions" with those seeking adequate budgets and have "listened intently to the views expressed". But are they really listening; are they really expanding on mere hearing and paying attention to the meaning of what they are being told? For safety's sake, I would like to think so, but somehow I have my doubts. And I do not suppose I am alone. Certainly I think I can count on the homeless and dispossessed of Fukushima, and the families, friends and workmates of the Pike River miners whose bodies have never been recovered. **APF**

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An Icon worth Preserving

James M. Shannon

NFPA

Earlier this year NFPA's membership journal highlighted two stories about iconic American locations where recent renovations have received a great deal of public attention. Even so, the real importance of those changes is little understood by the public, or by the media that has reported on them.

Fenway Park, in Boston, Massachusetts, the oldest major league baseball stadium currently used in the United States and the Statue of Liberty in New York City are two of the most popular tourist attractions in the United States, but both were built at a time when our understanding of life safety issues was far less developed than it is today. Both have been significantly spruced up, but along with the beautification have come long-overdue improvements that will make them far safer for the millions of visitors they welcome every year.

The fact of the matter is that most people around the world do not pay much attention to the safety features in the buildings where they live, work, or seek entertainment. A friend of mine who is a strong NFPA advocate told me about a recent visit he made to his long-time doctor who had just moved into a new office. When the doctor asked how he liked the new office, my friend said it looked nice, but then asked the doctor why he did not have fire sprinklers installed as part of the renovation. The doctor looked up at the drop ceiling and said: "I thought I had sprinklers."

People assume that if they visit a famous location, buy a house, or lease a property for a business, then the building must be safe. But they should make that assumption only if the city/country in which the building is located has adopted the right code and is committed to enforcing that code. At NFPA we know that that is not always the case. In the United States some jurisdictions are only too happy to ride with outdated codes or neglect aggressive enforcement. When budgets get cut in a tough economy, interests that can make money by skirting reasonable code provisions take advantage.

We are seeing this troubling trend in many different guises. We certainly see it in the struggle over residential sprinklers and the consensus of both NFPA and the International Code Council processes that sprinklers should be included in all new construction of one- and two-family homes. Homebuilders argue, with no evidence, that the simple inclusion of sprinklers will make houses unaffordable for middle-income people, even when the experience of jurisdictions that have adopted sprinkler provisions demonstrates conclusively that housing costs are not substantially different where sprinklers are required.

Some states are talking about skipping a whole cycle of code revisions to save money, denying their citizens the benefit of important advancements and the use of improved technology that can save lives and property. Jurisdictions are merging fire and building code enforcement, claiming they are just trying to make things more efficient, when in fact what they are doing is scaling back their commitment to code enforcement.

The fact of the matter is that most people around the world do not pay much attention to the safety features in the buildings where they live, work, or seek entertainment.

We have to make people more aware of how codes protect their safety, and we have to raise the visibility of a whole system of code development, adoption, and enforcement. NFPA codes and standards have been translated into Chinese, Korean, Japanese, Thai, Spanish, French, Arabic and Portuguese. We continue collaborating with local governments worldwide on code use and adoption. The stories about Fenway Park and the Statue of Liberty, two classically American locations, illustrate how lucky we are to have in place a system to protect public safety that has stood the test of time. We would love to hear about an iconic location in Asia Pacific to share with our membership. Our worldwide commitment to safety through strong codes is a global icon that we have to work to preserve. APF

James M. Shannon is NFPA's President and CEO

For further information, go to www.nfpa.com

New Portables Offering

CHUBB FIRE & SECURITY UK has launched its FX range of fire extinguishers that feature what is described as an innovative quick release mechanism and an ergonomically redesigned handle, lever and hose grip. The new range is lighter in weight, easier to use, and many models also offer enhanced fire ratings.

The FX range is being promoted as meeting the demand for a new generation of products that are easier to handle, lighter, more intuitive to use, and deliver the highest performance when people or property are at risk. The new design will ultimately feature throughout Chubb's family of water, foam and powder products.

A key element of the FX extinguisher range is the high-performance, engineering-grade plastics used in the handle and lever design, compared with metal. The FX range also features: increased lever length so that the handle and lever can be more comfortably compressed; sufficient clearance between the handle and lever when compressed to prevent fingers from being trapped; and increased handle breadth to rest more comfortably within users' palms. Other features include modified handle shape for safer handling and improved corrosion resistance for the handle and valve assembly.

In terms of the safety release mechanism, the traditional pin that prevented the extinguisher from being discharged accidentally has been replaced with an easy-pull clip with arrows to show a clear direction of 'pull' in order to activate the extinguisher. When the clip is pulled, the word 'USED' then appears. Another key feature of the new FX range is the grip on the hose to make extinguisher use more intuitive such that the user is immediately 'guided' to where the hose should be held.

The FX range has been designed for environmental safety and end-of-life recyclability and does not contain any materials of concern. All materials meet or exceed BS EN3 requirements, such as additional UV degradation tests and resistance to ozone and chemical substances. The FX range also complies with the British Standard Kitemark where required and the Pressure Equipment Directive (and where necessary the Marine Equipment Directive) and features the CE mark and/or Ships Wheel.

For more information, go to www.chubb.co.uk

PPE Design Rethink

ROSENBAUER has introduced what it describes as "the completely new design" Fire Max 3 that is said to provide extremely low water vapour transmission resistance with the result that perspiration is expunged from of the suit very rapidly while optimum protection is retained. Heat accumulation is largely prevented and moisture evaporates quickly into the atmosphere. Rosenbauer has also introduced a PTFE membrane for the first time, which provides excellent heat and flame resistance ratings.

The new three-layer material design of the Fire Max 3 achieved a low value of 15 m²Pa/W during resistance to evaporating heat transfer testing. This contrasts with the water vapour transfer resistance of ≤ 30 m²Pa/W generally required in the highest class by the current standard. In spite of this high level of breathability, the Fire Max 3 also has a safety thermal lining in order to provide excellent protection even in extreme conditions. Fire Max 3 weighs just 3.1kg (size 48-50).

The new Fire Max 3 is available with two outer fabrics options: PBI Matrix in golden yellow, and Nomex Tough in dark blue and gold. The outfit has numerous pockets, holders for lamps and badges of rank, ergonomically designed knees and elbows and removable trouser suspenders and zips. New Nomex knitted cuffs with thumbholes can be added to the sleeves, in order to prevent them from sliding up the arms.

For more information, go to www.rosenbauer.com

New Extrication Tool Holder

ZIAMATIC CORPORATION has added the QM-ET-V vertical extrication tool holder to its line-up of extrication tool mounting solutions. Claimed to be ideal for hanging cutters, spreaders, and combination tools on the doors or walls of an apparatus compartment, it consists of three heavy-duty aluminum components – a hanging cradle and two curved tip brackets – that are configurable to accommodate most tools.

The holder can be mounted to nearly any vertical surface. To secure the tool, simply slide its grip handle into the cradle support and allow gravity to do the rest. Adjust the tip brackets and PVC-coated security hook to keep the tool from shifting or bouncing when the apparatus is in motion.

For more information, go to www.ziamatic.com

Protecting the World's Travellers

Paul Pope, Business Innovation Manager at Apollo explains why fire detection systems in airports present a unique set of challenges for both equipment developers and installers.

Flying is an increasingly popular form of travel – airports across the globe handled more than 5.4billion passengers in 2011. Sydney Airport, one of the oldest operated airports in the world, handled 36 million of these and the Asia-Pac region also plays host to the world's second largest airport – Beijing Capital International –serving just under 78 million passengers annually and operating out of three terminals one of which is 1,170,000 square metres. The focus is often on the innovative security in operation in these environments and fire detection can sometimes remain its silent partner. In reality, however, it is no less vital to the smooth running of any airport.

Planning, installing and commissioning a new fire detection and alarm system in an operational airport is a challenging task. International airports are vast spaces, from the passenger terminals to the aircraft hangars they are a conglomeration of unique environments, each requiring a different type of fire detection solution. In addition, airports operate 24 hours-a-day, 365 days-a-year – meaning any installation or testing has to be carried out alongside a fully functional fire detection system to ensure continuous cover. Finally, the millions of passengers using the transport system need to be considered. In the most part they will be unfamiliar with their surroundings, orientated to a different time zone and speaking different languages. It is essential that fire alarm system and evacuation strategies provide simple and intelligible methods of notification and guidance to allow for a safe controlled evacuation in a timely manner.

It is important that all areas of the building are assessed to ensure the appropriate type of detection is used for the differing fire risks. Understanding the type of fire risk, materials present, fire load, environment, sensor technology and the best detector locations are critical for early and reliable fire detection. For most risks, optical and multi-sensor (optical and heat) are the detectors of choice. Other sensor technologies such as ionisation, carbon monoxide (CO), beam, and flame (UV/IR) can be used to detect specific fires or provide protection in environments where optical sensing technology is unsuitable. Carbon monoxide detectors are particularly suitable for assisting smoke detectors and providing earlier detection in buildings where there are deep-seated smouldering fire risks or a likelihood of smoke stratification taking place in areas such as roof voids or complex cellular ceiling structures (ceiling height dependant).

Other than a fire itself one of the most damaging events for an airport is a false alarm. The financial cost of an evacuation is immense and it could also present a number of security risks as well. Detectors are available with selectable response modes that are inherently designed to reliably detect a wide range of fires. With this inbuilt flexibility detectors can also be adjusted to provide the best detection performance while reducing unwanted alarms even in harsh and dirty environments (such as baggage sorting areas). Most modern detectors are now designed to provide immunity from these environmental conditions.

As passenger numbers continue to rise those involved in fire detection have a duty to make sure that the right technology is in place to ensure they are protected on every step of their journey. APF

For more information, go to
www.apollo-fire.co.uk

Detector Simulator Aids CBRN Training

ARGON ELECTRONICS has launched the LCD3.3-SIM, a new detector simulator that is aimed at enhancing the efficiency and safety of CBRN (Chemical, Biological, Radiological and Nuclear) response training by responding to electronic simulation sources that represent chemical vapours, toxic industrial substances or false positives. Training exercises using the LCD3.3-SIM detector simulator can be set up swiftly and safely, with no need to use simulants that are harmful to the environment or the personnel involved.

As they pose no risk to health, the electronic simulation sources can be set anywhere, including within public buildings, in less than ten minutes, and the menu structure of the LCD3.3-SIM simulator can be configured to match precisely the menu structure and language options of the actual detector. It is available as a first-responder product and can be used to simulate a wide range of emergency conditions, including the presence of nerve, blister, blood, choking agents, TICs and false positives; contamination, decontamination and persistency; and the effects of wind direction and temperature.

The instructor can use a remote control to determine the effectiveness of decontamination drills by controlling the remaining contamination, to simulate persistency and the effects of wind or temperature, and to instantly reset a scenario for the next exercise. The LCD3.3-SIM is compatible with other simulators designed by Argon Electronics, including AP2C-SIM, CAMSIM and CP100-SIM, permitting multi-detector, multi substance training to take place within the same training scenario. It is also fully compatible with Argon's Plume SIM system.

For more information, go to www.argonelectronics.com

The Force is With You

Australian fire alarm system and product supplier, FUSION FIRE SYSTEMS, has been acquired by ADVANCED ELECTRONICS' newly formed Australian subsidiary, Fusion Advanced, creating what both companies describe as: "a new force in the sector".

Fusion, which was formed in 2007, is based in Sydney and Melbourne, works throughout Australia, and has worked closely with Advanced as its key product supplier, obtaining the highest local JAS-ANZ approvals certified by SAI Global.

Advanced Electronics' products sell in more than 70 countries, with bases across the UK, the USA, Middle East, India and now Australia.

For more information, go to www.advel.co.uk

Further Third-Party Approvals

GRINNELL has announced that it has achieved further third-party approvals of its G-Press product line. The core range of G-Press stainless steel products, ranging from 22mm to 54mm, with existing VdS and FM approvals, is now LPCB (Loss Prevention Certification Board) approved. The VdS and FM certification has also been extended to the larger sizes from 54mm to 108mm.

For more information, go to www.grinnell.com

Piping System Receives Enhanced UL Listing

Fire protection and life safety systems company, VIKING CORPORATION, has received an expanded UL Listing for its BlazeMaster line of CPVC piping products that allows for exposed piping installations in basements with composite wood joists.

Previously, when sprinklers were installed in an unfinished basement with composite wood joists, a layer of drywall was required to cover the CPVC piping network. Alternatively, metal pipe could be used in these applications. With this new UL Listing, provided certain conditions are met, Viking's CPVC piping system can be installed exposed, without the need for additional drywall protection. The result is a lower total installed cost for residential sprinkler systems.

For more information, go to www.vikinggroupinc.com

True Battery Power and Freedom

The new Greenline battery pump SPU 16 BC from HOLMATRO brings true battery power to any rescue operation. Our concept is based on the power and duration that rescuers actually require from battery technology, which is why ours sits inside the pump, and is not attached to our tools.

LiFePO4 battery technology is the most powerful available and also the most environmentally friendly, giving the Greenline battery pump SPU 16 BC true green credentials. It can be charged on board any vehicle from 12v (via inverter) or can be removed and charged separately. Full charge takes just one hour from empty. However if you only use a quarter of the battery, you are fully recharged in approximately 15 minutes.

True Battery Performance

Making the move to battery technology means you must have the performance required on scene; not just for vehicle extrications, but for all rescue operations. The Greenline battery pump SPU 16 BC will run for 90 minutes during standard extrications (intermittent tool use) and run idle for three hours. To test the true power of the battery, fully load the pump at maximum pressure (720 bar) and measure the time. The battery will run fully loaded for 28 minutes.

This is true battery performance. This is what is required on scene and allows rescuers to work without worrying about changing batteries.

3-Stage Pump

The Greenline battery pump SPU 16 BC is 3-stage, which delivers a higher oil flow in the second stage, increasing tool speed, yet still allowing ultimate control. This kind of pump performance would not have been possible if you had fitted the pump and battery to the tool. The ECO whisper mode means that it is extremely casualty friendly and the ability to site your pump away from the scene means that communication and casualty care are not compromised.

The pump is light weight, ergonomic and is easily carried by one person. With the optional Quick Fix & Release Bracket you no longer have to devise your own solution for securing this pump in your rescue vehicle. Thanks to its universal mounting, this bracket fits in any truck. Using the bracket saves precious time during a rescue operation, protects the pump from damage, saves valuable vehicle space and is less physically demanding for rescuers.

Instantly Adopt Battery Technology

Our concept allows you to adopt battery technology and continue to use your existing Holmatro CORE tools, giving you the freedom to work indoors, underground or anywhere where emissions would cause a problem. This also means that you can easily expand your tool range and you are not limited to individual battery tools. Of course having the battery technology positioned within the pump means that your hydraulic tools remain light, well balanced and ergonomic.

Operational Advantages – True Freedom

Rescues in or near water, whether from vehicles or in USAR operations, are the type of incidents that has to be planned for. However, with the Greenline battery pump SPU 16 BC you have genuine freedom. All of the Holmatro tools can be safely used in or near water while the pump can be safely sited away from the scene of operations.

The pump is also suitable for use in wet weather conditions, so outside use in heavy rain is no issue. Nor is cold weather, the battery is good for use down to –20°C. The Greenline battery pump SPU 16 BC is also ideal for use at altitudes above 1000 metres and can also be used on rescue aircraft where the carriage of fuel is prohibited.

Conclusion

Battery technology in rescue operations is nothing new and specialist battery powered tools have been available for a number of years. However, the technology required to deliver the desired power and duration has, until now not been available. The 3-stage Greenline battery pump SPU 16 BC truly is the first pump that rescuers can take anywhere and be confident of optimum performance. APF

For more information, go to www.holmatro.com

New Hood Complements PPE Offering

Bristol Uniforms has launched its own in-house designed-and-manufactured fire hood range in what the company describes as: "a move to provide customers with bespoke PPE products to complement Bristol's growing range of fire coats and trousers". The new fire hood is available in two styles and colours.

The Bristol Fire Hood 1 is a two-layer construction using a PBI Gold Rib outer with an Aramid Viscose inner layer. The Bristol Fire Hood 2 is black and incorporates a double layer carbonised fibre/para aramid blend. Both new products are designed and manufactured to BS EN13911:2004.

Both products are described as: "superbly comfortable, providing improved fit in garments that are both breathable and wickable". Among the benefits claimed for the new fire hoods are that they are easy to put on and take off, and provide increased coverage to the shoulder area to reduce the risk of 'roll up' around the neck and when worn with a breathing apparatus mask. The flexibility of the fabrics used ensures full security in operational situations.

For more information, go to www.bristoluniforms.com

New Gas Tester

According to CROWCON, its new T3 Gas Tester ensures that the company's Tetra:3 (T3) portable, multi-gas detector complies with relevant national/regional safety regulations and individual company requirements. It is a lightweight, stand-alone unit ideal for both on-site and in-field gas testing.

The device feeds the T3's sensors a known concentration of gas, a process known as 'bumping', to ensure the sensors are working correctly. The way it works is simple; when a T3 is inserted into the gas tester, the T3 automatically switches into 'bump' mode and either passes or fails. Once the test is complete the T3 is removed and the bump result is then accepted by the user and automatically logged in the T3. When the test has passed, the user is safe in the knowledge that the detector is in good working order. If it fails the bump, it informs the user that the instrument needs to be re-calibrated or serviced. All this is done without requiring a power supply, as the T3 detector does all the work.

The Gas Tester can bump for flammable, oxygen, carbon monoxide, hydrogen sulphide and carbon dioxide sensors. Capable of testing up to four gases within just 60 seconds, it ensures all T3 detectors in a fleet are working correctly. In addition, the device also tests that a T3's visual and audible alarms are working correctly. When used with a fixed flow regulator, the Gas Tester allows approximately 100 bumps for every 34 litres of quad gas (four gases in one cylinder).

For more information, go to www.crowcon.com

On Your Bike

BRISTOL UNIFORMS has designed what it describes as ground breaking firefighter PPE for use by members of fire crews using motorcycles to gain rapid access to fires in congested or remote locations where normal fire response vehicles would have difficulty gaining access.

The new coat and trouser combination protective clothing, which meets the road safety requirements for professional motorcyclists, has been fully tested and meets four separate European Standards, three of which relate specifically to motorcyclist protective clothing and one to firefighter protection.

The coat and trouser have been ergonomically designed to ensure ultimate fit, suitable for riding motorcycles and firefighting duties. They are designed to be zipped together and are available in 28 sizes, both male and female. The ensemble is machine washable after the back, shoulder, elbow, hip and knee protectors have been removed. The suit comprises four layers: an outer fabric that has excellent tensile, tear and abrasion qualities; a Gore-Tex Fireblocker moisture barrier; a thermal protective fabric that also provides excellent abrasion resistance; and an Aramid/Viscose lining.

For more information, go to www.bristoluniforms.com

Hainsworth Traces its Aussie Roots

They say that Australia was built on the sheep's back and British textile manufacturer Hainsworth can trace its own connections with the country back more than 200 years.

The precise date was 1807 when Yorkshireman, Reverend Samuel Marsden, transported from the fledgling Australia to England the first wool for commercial use. As it transpired, the Hainsworth mill rejected that first shipment of wool, but it marked the start of a long and fruitful relationship that continues to this day. Although it chose to pass on that first batch of wool, Hainsworth has being buying Australian Merino wool ever since. And perhaps the most high profile example was in the uniforms worn by Prince Charles and, more recently, Prince William at their respective weddings.

While the company's relationship with Australia covers more than two centuries, for virtually all of that time it has been about the import of wool into England for use at its textile mill in the Yorkshire town of Pudsey, near Leeds. Only recently, has the relationship taken on an exciting and dynamic new turn as Hainsworth now increasingly looks to export its innovative Personal Protective Equipment (PPE) fabrics to countries around the world, including Australia.

Hainsworth is able to offer a range of solutions using TI-technology – a patented double-cloth construction with Nomex on the face to provide optimal thermal protection, abrasion resistance and colour fastness, and Kevlar on the back to provide strength. The kits offer exceptional heat stress management capabilities as well as comfort, wear life and durability, heat and flame protection and chemical resistance.

Earlier this year, the Australian Capital Territory Fire & Rescue chose to wear kit that incorporates Hainsworth TITAN, following a successful trial in conjunction with Australian garment manufacturing partner Stewart & Heaton. ACT Fire & Rescue decided to change its structural kit as part of a new ensemble. The kit, worn by more than 400 firefighters, continues to be lime green to improve visibility.

One of the main reasons Hainsworth is so closely aligned with the PPE industry is because of the Australian Merino wool that it uses. Until 1987 in the UK, and slightly later in Australia, felted Merino wool cloth had been used for the manufacture of firefighters' PPE, but while it was undoubtedly a great fibre, a major downside was that it held too much moisture and consequently became extremely heavy and wet for the wearer. Now, thanks to advances in textile production and finishing, the many benefits of wool are making a comeback, but with a modern twist.

Tom Hainsworth

Hainsworth is delighted to be playing its part in ensuring that Australian Merino wool has a big future in the manufacture of firefighters' kit. An example of this is Hainsworth ECO-DRY, an innovative range of lining fabrics incorporating the many benefits of wool to provide today's firefighter with the highest possible standards of comfort when wearing PPE. The unique structure of wool offers distinct properties not mimicked by any other natural or man-made fibre; properties that offer many benefits to the wearer and that will not wash out or decline over time.

Tom Hainsworth, Managing Director of Hainsworth, said: "Today's kit has to perform many duties to protect the modern firefighter, which are often at odds with each other. It must stop water and heat from outside the garment getting through to the wearer while allowing water – sweat in the form of moisture vapour – and heat from the wearer to dissipate to the outside. It must be robust enough to offer high levels of thermal and mechanical protection while being light and breathable enough to minimise heat stress."

"Since we put in place our export strategy for the PPE industry two years ago, we have concentrated on taking three core messages to our customers: Design that Saves, Protection that Shows and Quality that Lasts."

"Our commitment to firefighters and using the finest Australian Merino wool is perhaps stronger today than it has ever been, and we can look forward with confidence to the next 200 years working in partnership." APF

For more information, go to
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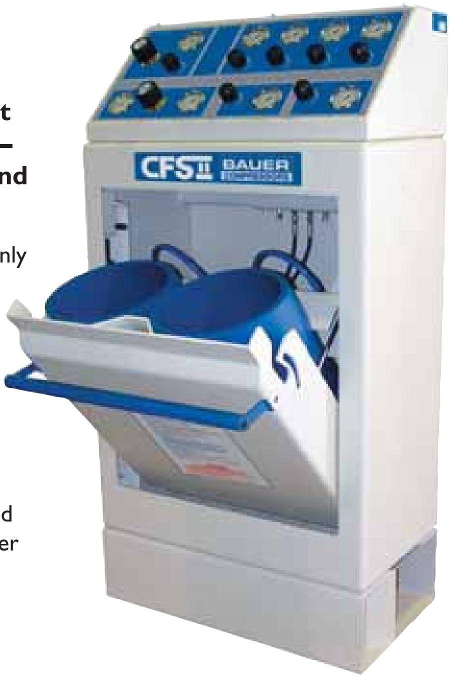

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New Compliant Fire Pump

WATEROUS has introduced the new Passport single-stage fire pump that meets both EN 1028 and NFPA 1901 compliance requirements creating, the company claims, a new benchmark for international pumps.

The new pump has an oil-free primer and self-lubricated sealed bearings, built-in automatic primers with manual shutoff; it weighs less than 91 kilogrammes and delivers up to 3,000 litres-a-minute at 15 bar. The new Passport comes with a five-year warranty.

For more information, go to www.waterousco.com

Improved Satellite Broadband Service

EXCELERATE TECHNOLOGY GROUP has announced the launch of its new enhanced resilience satellite network (ERSN) service, a development that the company says will provide all of its customers with access to two independent satellite networks instead of one, guaranteeing automatic backup for mobile satellite broadband services used by emergency services. This will ensure that emergency services' customers have the reassurance of uninterrupted access to satellite service during periods when communications services may be under threat or suffering from disruption.

On the Enhanced Resilience Satellite Network, Excelerate customers are spread over two satellites. If one fails, the customers on the failed satellite are switched almost instantly to the second satellite. According to Excelerate, no other provider can currently do this. If one teleport fails, the other seamlessly takes over the capability. In addition, a third teleport is on permanent standby should it be required.

Real-time bandwidth provisioning and failover is managed 24/7 by Excelerate, not a third party. Service level agreements and budgets are matched to customer requirements and delivered dynamically, meaning our customers' applications are always operational.

The company is at pains to point out that not all mobile satellite broadband services are the same. Some, while appearing cheaper, are actually open to public access and are not capable of offering the same level of robustness under pressure that the company's Enhanced Resilience Satellite Network can provide – automatically and at all times. Its satellite capacity is not shared with third parties and cannot be commandeered by other operators or users under any circumstances.

All Excelerate customers will automatically be upgraded to the ERSN service, which is available only to Excelerate clients.

For more information, go to www.excelerate-group.com

PROFILE

IWMA 2013 Water Mist Seminars

First 2013 seminar to be held in Dubai in January during Intersec

For the International Water Mist Association (IWMA) the year 2012 has indeed been busy and exciting. Busy, as with yet another successful annual conference, which this year took place in Barcelona, the IWMA was able to strengthen its position in the world of fire protection. Exciting, because of the move from the small town of Heyrothsberge near Magdeburg to the cosmopolitan city of Hamburg in the North of Germany.

But with 2012 drawing to a close, the IWMA is looking ahead and is concentrating on its future activities. In fact the main focus of attention at the moment is the six seminars on water mist fire protection, which the IWMA is currently planning.

The first of these seminars is going to take place in Dubai on 15th January at the Dubai International Convention and Exhibition Centre, which at the same time is host to InterSec. One of the companies that will take part in this seminar is VID Fire-Kill from Denmark. CEO Alex Palle says: "As IWMA member we appreciate this opportunity to attend the seminar and inform the audience about the latest knowledge within water mist systems, including how they work, what they can protect, and how they are approved." This certainly reflects the concept of the seminars, during which experts from different fields of water mist explain their schemes and answer questions from an international audience.

Apart from the seminar in Dubai there will be one seminar on 19th March 2013 in Hvidovre, Denmark at the DBI. The other four seminars will be held in France, Italy, China and India during the course of the year. And then of course there will be the 13th annual international water mist conference in the autumn. APF

For more information, go to www.iwma.net

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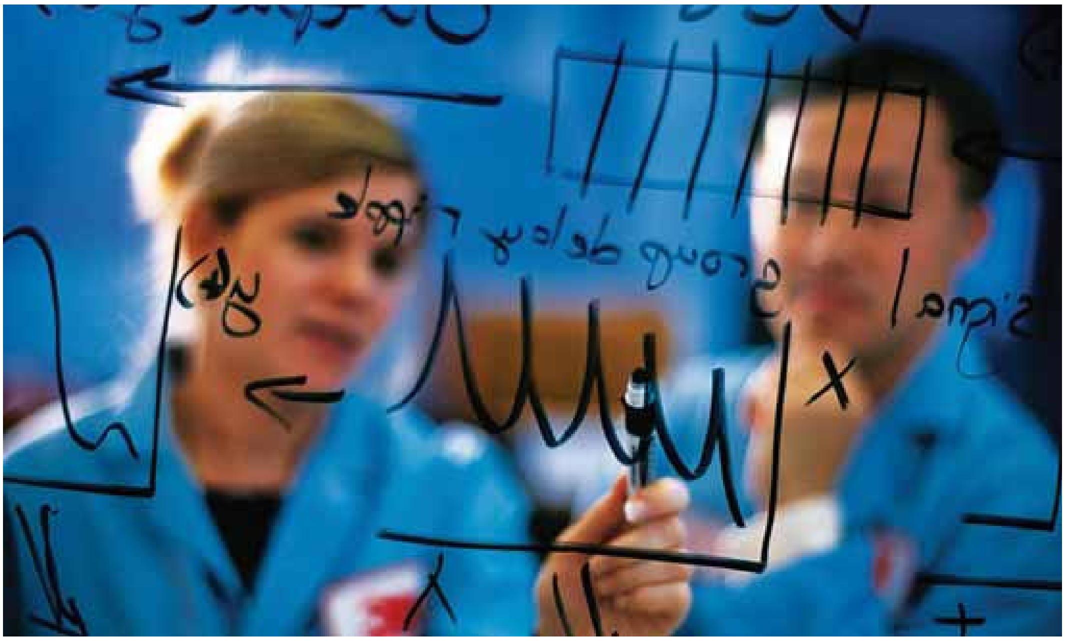


George Ip

3M

Building-in Sustainability

In today's world where freak storms and flash floods are becoming more of an occurrence – heightening the possibility of global warming causing repercussions – the integration of sustainability into the ever-growing infrastructure landscape is hence more important than ever.

From the global corporate world, to various industries ranging from building and construction to healthcare and manufacturing, green watchdogs are encouraging management and opinion makers alike to integrate social and environmental considerations into core business practices. These encompass day-to-day operational procedures, policies, strategies and long-term projects.

In the area of building and construction, architects, engineers and facility designers are only too aware that sustainability in any structure can only be achieved by taking the long-term view and by seeking more efficient materials with lower climate impacts. Green building solutions do exist and come in all forms, sizes and functions. From UV-protecting window films to energy-saving water filters; even systems for critical functions such as fire suppression – where safety cannot be compromised – can be improved to reduce climate impact.

Available in the market today are fire suppression products that are classified "clean" or labelled "green," and then there are those that claim to be both "clean and green." "Clean" and "green" are deceptively simple concepts; but true sustainability is more complex.

On the surface, for instance, water is often regarded as the "cleanest" or "greenest" fire extinguishant. Undoubtedly, water is extremely effective at putting out fires. However, it is unsuitable for applications where continuity of operations must be maintained; namely vital areas such as data centres, emergency response facilities and telecom installations. Water conducts electricity and can contribute to the spread of electrical fires; it can also irreparably damage sensitive electronic equipment, paper records, historical archives and other high-value assets, all of which could cause serious interruptions to business continuity. So, in the high-tech world of the present millennium, where many of our crucial systems depend on electronic data, water is clearly no longer a sufficient first line of defence in any number of applications.

Viewed as an alternative to water, chemical fire suppressants have long been made available, but these agents faced problems of a different kind. Halons, a class of gaseous "clean agent" extinguishant, seemed to be an ideal solution at first and were very popular beginning in the 1950s. These clean agents are non-conductive and leave no residue, making them safe for use on electronics and electrical equipment. They were widely used for several decades until research showed that Halon emissions were depleting the ozone layer. So much so that the 1987 the Montreal Protocol regulated a coordinated phase-out, and by the mid-1990s most Halon production had ceased in Europe and in USA.

In light of the phase-out of Halons, hydrofluorocarbons (HFCs) were then introduced to the market as first-generation Halon replacements, as they had zero-ozone-depletion potential. However, HFCs (such as HFC-227ea, branded as DuPont FM-200) were found to have high global warming potentials (GWP) and relatively long atmospheric lifetimes. In fact, HFCs sold into fire suppression have the highest GWPs relative to other HFC markets, such as general solvents manufacturing and foam blowing. While HFCs currently represent only a small portion of greenhouse gases, they nonetheless steadily accumulate in the atmosphere. This rapid growth did not escape the attention of policy makers who previously implemented the phase-out of ozone-depleting substances.

By 2012, Asia Pacific countries participating in the Montreal Protocol (including Australia, China, India, the Republic of Korea and Singapore) completed the Halon production phase-out in accordance with the terms of the treaty. Presently, architects and engineers must turn to Halon replacement technologies when they build and retrofit with sustainability in mind. The APAC region, however, has more alternatives at the present time than western countries had two decades ago.

For example, in 2003, global diversified innovation company 3M introduced FK-5-1-12, a second generation Halon replacement that offers an environmental profile superior to HFCs and other “first generation” alternatives. FK-5-12, branded as 3M Novec 1230 Fire Protection Fluid, is not only an advanced clean agent, it is also environmentally sustainable. Designed to address the need for extinguishing efficiency, human safety and environmental sustainability, it knocks down fires over twice as fast as inert gas or CO_2; extinguishing a fire even before it reaches the “flame” stage. With zero-ozone-depletion potential, a global warming potential of One, and an atmospheric lifetime of just five days, FK-5-1-12 can deliver up to a 99 percent reduction in greenhouse gas emissions relative to HFCs.

As a clean agent, FK-5-1-12 is safe for use on sensitive electronics and allows uninterrupted operation of energised equipment, keeping essential facilities up and running even in the event of a fire. It also offers the widest margin of safety relative to other chemical clean agents, CO_2 and inert gas mixtures. Transportation of the agent is also much safer and easier than gaseous materials as FK-5-1-12 is stored as an unpressurised liquid, contributing to a more cost-efficient supply chain.

Currently, there is uncertainty in the fire protection industry about the ultimate impact of global policy as governments consider possible initiatives to phase down HFC production under the Montreal Protocol. Given that there are alternatives available with substantially smaller climate footprints, it is likely that HFC use will be taxed or further restricted regionally or through an international treaty.

In July 2012, the Australian government introduced an equivalent carbon price to synthetic greenhouse gases (SGG) under its Clean Energy Future Plan, aiming to create a financial incentive to reduce emissions, and encourage consumers to consider purchasing products containing alternative gases. SGG are industrial chemicals used predominantly as refrigerant gases in air conditioning and refrigeration equipment; in foam blowing; as propellants in aerosol products; in the pharmaceutical industry and electricity supply, as well as fire protection industries.

Synthetic greenhouse gases generally have high GWP, typically in the range 140 to 23,900 times that of carbon dioxide, and can persist in the atmosphere for many years. The Australian legislation applies to SGG covered by the Montreal Protocol, specifically hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF6). The price per tonne of SGG is based on the carbon price and GWP for each gas relative to GWP and carbon dioxide. With the application of this carbon tax, the cost on HFCs sold into fire suppression would increase by as much as 300 percent.

The European Union (EU) is also in the process of revising its F-Gas Regulation, and the ultimate regulation is likely to phase down production or import of HFCs into Europe. The EU may, at the same time, restrict the use of HFCs in sectors like fire suppression where alternative technologies are already available.

Though there are some technologies that are offered as “green” fire protection alternatives such as water mist, inert gas and CO_2, do bear in mind that these elements are not suitable for many modern commercial applications. Inert gas, for example, takes longer to discharge and requires significant storage space; CO_2 can be lethal at concentrations high enough to extinguish fires; and, as stated previously, water can cause serious damage to electronics and other contents of a protected space.

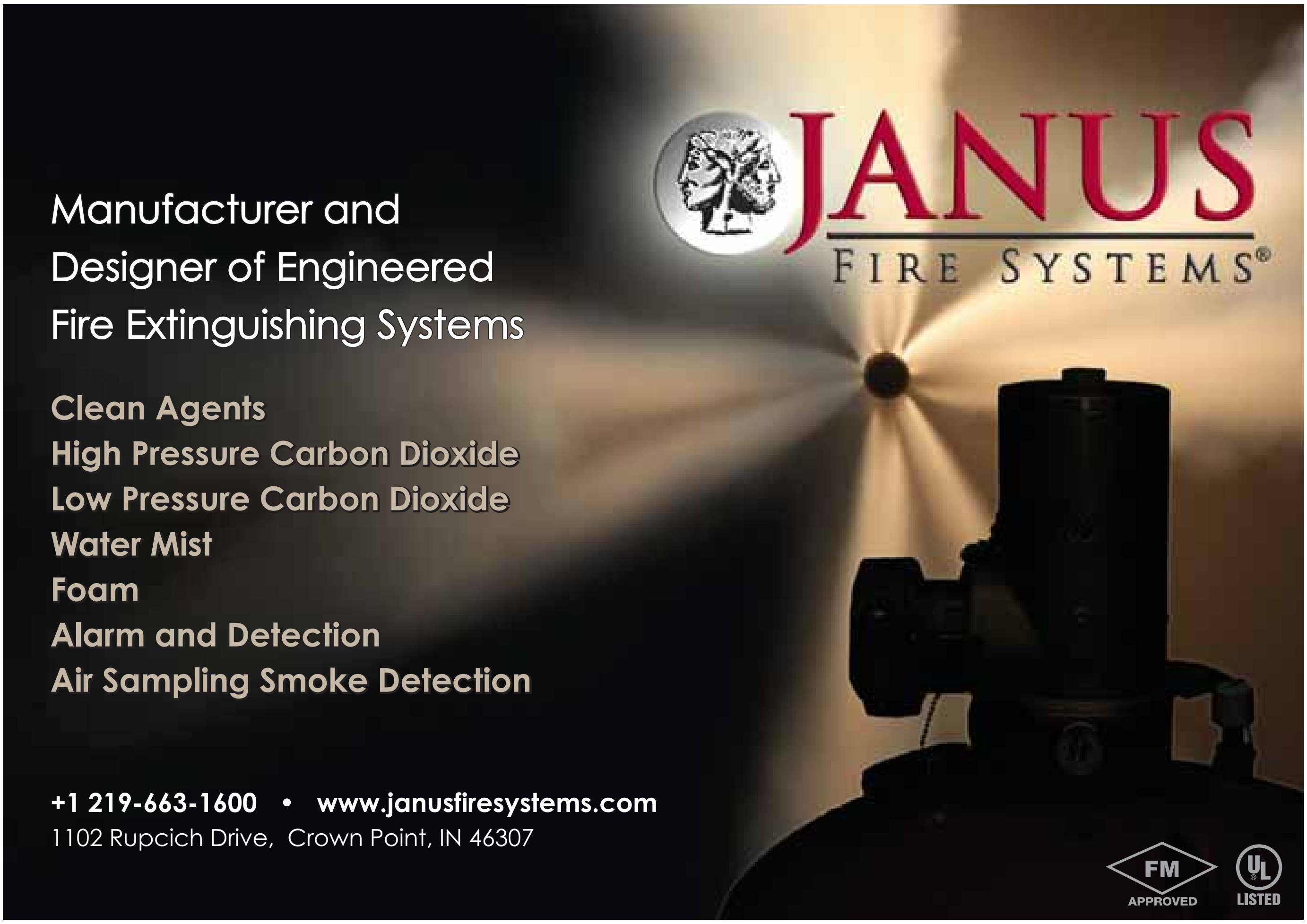
Next generation clean and green fire suppressions agents such as FK-5-1-12 are designed to address present concerns affecting sustainability – including the environment, human safety, business continuity and long-term economic viability. With this technology, green-minded architects, facility designers and engineers in the Asia Pacific region have an opportunity to design tomorrow’s buildings and structures with the most advanced fire protection available, leading the way toward true long-term sustainability, without the ozone-depleting carbon footprint of HFCs.

A new representative example is the National Art Gallery, Singapore, a new visual arts institution that is being retrofitted out of two iconic 80-year-old heritage buildings – the former Supreme Court and City Hall. Scheduled to be completed in 2015, the Gallery will house an extensive collection of Singapore and Southeast Asian art. The Gallery’s key criteria in choosing a fire suppression system is that: it has to put out fire quickly; there would be no implication on the artworks when extinguishing a fire; and it requires less space, which is vital in protected areas that do not have space to provide pressure relief openings. As FK-5-1-12 is able to fulfil all of these criteria, design consultants of the 60,000 square metre art institution have opted to install the 3M next-generation clean fire suppression agent in the National Art Gallery, Singapore’s vital artwork storage rooms and data server rooms.

So, choosing fire-suppression material that is environmentally-friendly and requiring less floor space ensures the safeguarding of key areas such as the data centre and efficient use of space. As such, clean and green fire suppression products are here to stay, and for the long-term too, particularly next-generation clean agents with no ozone-depleting properties suited to protect critical telecommunication and data centre facilities, as well as storage space that houses priceless items such as a country’s national art collection. APF

George Ip is Senior Application Development Specialist in in APAC region for 3M

For further information, go to www.Novec.sg/Novec1230



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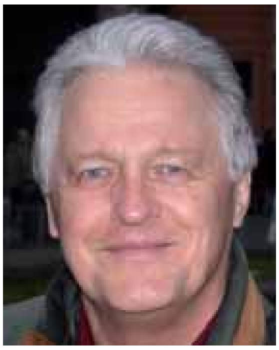
There is sufficient foam to continue discharging automatically for 15 minutes. A further 15-minute supply can be activated manually.
Pic copyright Graham Collins

New Hanger Protection Installed at Brisbane Airport



Graham Collins

Installing firefighting equipment in an aircraft hangar is as much about protecting the aircraft as it is the hangar itself, such is the cost differentiation between the hangar and its contents. Solutions have to be fast, effective and unerringly reliable if multi-million dollar aircraft are to be safeguarded. Asia Pacific Fire's editor, Graham Collins, recently witnessed a system being commissioned at a new hangar at Brisbane Airport – a "first" in Australia – that may well be destined to become the aviation industry's preferred solution.

Brisbane Airport is Australia's fastest growing airport with, according to Airservices Australia, currently 37,608 movements and more than 21 million passengers a year. It is also a central hub for aircraft maintenance, hosting major maintenance facilities for both Virgin Blue and Qantas. Indeed, Qantas has recently announced that it was adding to its Brisbane maintenance facility as work is transferred from Melbourne. The airport is also home to a fast growing list of leading aviation service providers and several additional hangers have recently been built or are under construction along the airport's eastern perimeter.

Traditionally, hangers, or to be more precise, the expensive aviation assets they house, are protected by either an AFFF deluge system or oscillating foam monitors. These solutions are not without serious shortcomings; in particular their lack of speed in extinguishing a typical hanger fire and the excessive amount of water used. There have also recently been several instances around the world where there have been unnecessary or excessive discharges of foam that have caused costly damage to aircraft and the unacceptable release of foam into the environment.

So much so that when Brisbane-based aviation supplier, Five Star Aviation, appointed international hanger construction specialist, Bettabuilt, to build a new 2500 square metre hangar at Brisbane Airport it took advice from Brisbane-based fire

Two detectors must register the fire before the foam is discharged. *Pic copyright Graham Collins*

engineering consultants, Fire Engineering Solutions. The outcome was a solution to the hangar fire protection challenge that has just been installed, commissioned and tested and is believed to be the first of its kind in Australia. It was project managed by Fire Engineering Solutions and the equipment was supplied by Delta Fire Australasia.

Key Design Considerations

Hanger fire protection has been under the spotlight for some time by hanger owners and tenants, insurers of aircraft using the facilities and from Australia's federally-run airport authorities. This has resulted in a policy coming into force at Brisbane Airport that dictates that hangars will be approved only if their design prevents the release to the environment of any pollutants spilled inside the hanger – including fuel spills, contaminated water and foam.

Speed of response was also a critical consideration if damage to aircraft was to be minimised. According the USA's Federal Aviation Administration, tests have indicated that an aircraft fuselage skin exposed to fire could fail within just 45 seconds. However, once a fire has been extinguished, unnecessarily discharging more firefighting agent is costly, clean-up is more extensive, disruptive and time consuming, and containing the excessive foam adds to the cost and challenge of containment and disposal. So the brief for the new Five Star Aviation hanger called for a solution that would be activated only in the event of a genuine fire, and that would use only the necessary volume of foam to extinguish the blaze.

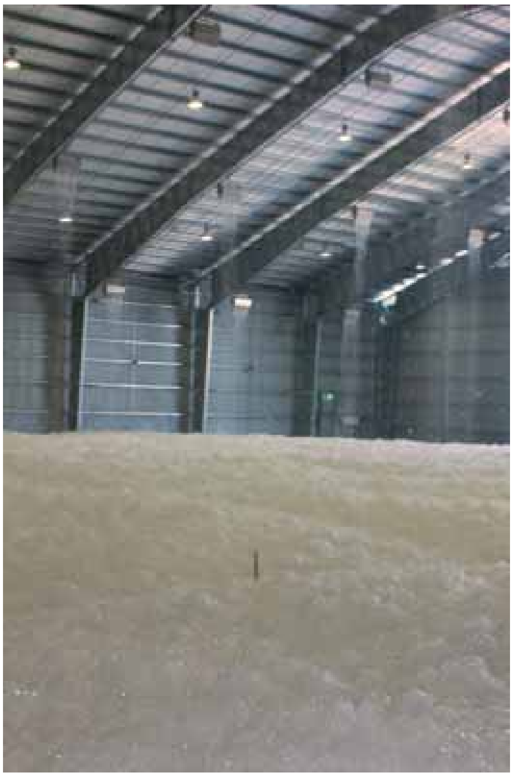
Other essential requirements included the need for the overall hanger fire protection solution to facilitate ARFF (Airport Rescue & Fire Fighting) and QFRS (Queensland Fire & Rescue) operations and compliance with the Australian Building Code. Cost effectiveness and ease of maintenance were also major considerations for the solution's designers.

Suppression Design Solution

The solution devised by Fire Engineering Solutions is described by the consultancy as "a simple but elegantly engineered solution" and encompasses several interrelated elements such as a brigade-connected fire alarm, sprinkler fire suppression in the office areas, a hydrant system both air-side and land-side, and hose reels and portable extinguishers. However, the two elements that set this installation apart are the use of a high-expansion foam deluge system that is triggered by flame detectors, and the foam capture and storage facilities.

Triple infrared flame detectors, designed for long distance detection and high false alarm immunity, are positioned in each corner to cover the entire hanger. To avoid unwarranted discharge of the foam, the flame detection system is configured to require two detectors to register the fire before the foam is discharged. However, the activation of the first detector raises the alarm both internally

Foam is discharged at the rate of 0.85 metres-a-minute, sufficient to suppress a fuel spill fire. *Pic copyright Graham Collins*



At the end of the test the mean depth of the foam blanket was 1.2 metres, equating to 0.9 metres-a-minute. Pic copyright Graham Collins

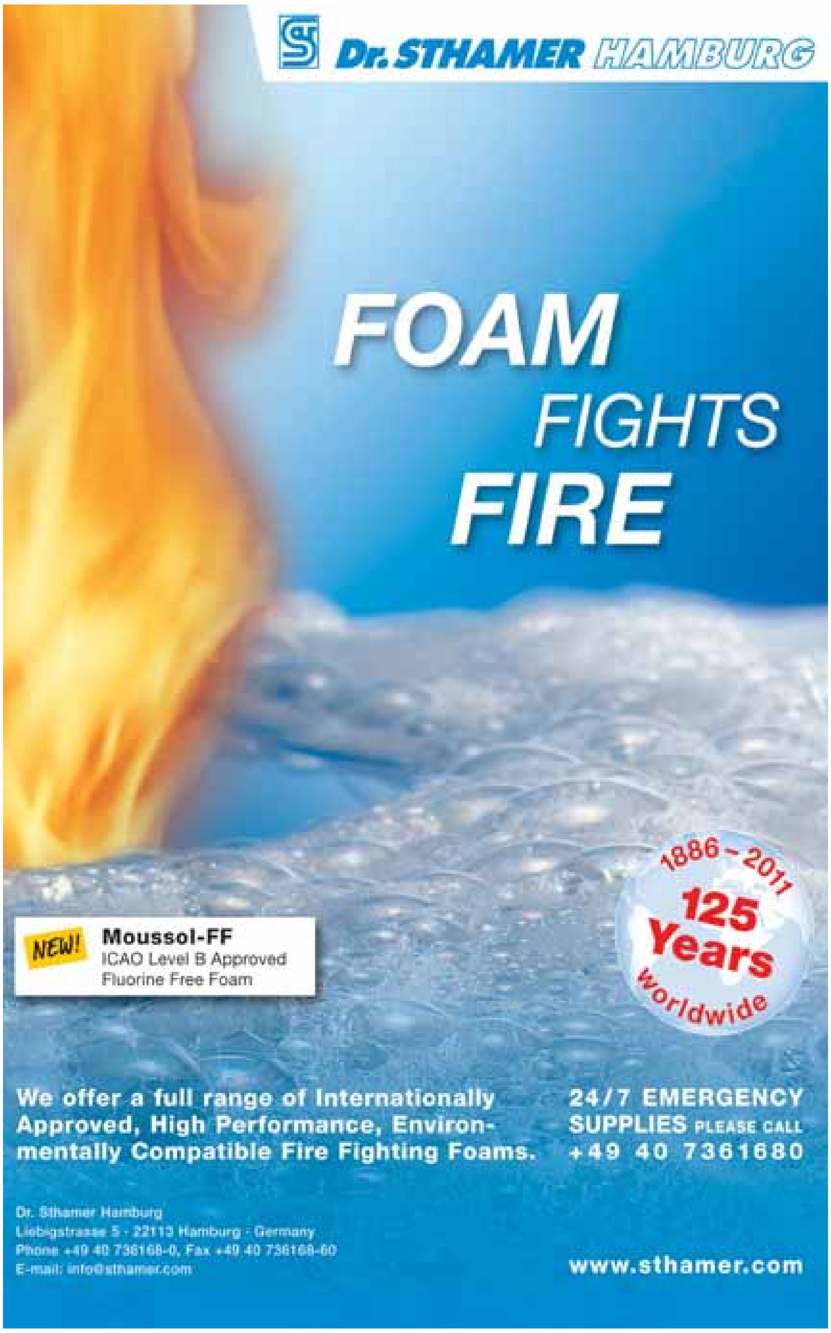
and at the airport's ARFF control centre. Four manual control stations are positioned adjacent to fire exits and these can be used to either start or stop the foam discharge, as can the control station in the fire pump house located alongside the hanger.

The fire protection solution at the new Five Star Aviation hanger at Brisbane Airport is believed to be the first of its kind in Australia. It meets a recently introduced directive that hangars will be approved only if their design prevents any release to the environment of pollutants spilled inside the hanger – including foam.

The foam is proportioned from special high-expansion concentrate and requires less than 1000 litres of concentrate to operate the system for 15 minutes. It is discharged from 36 high-level generators supported off the steel structure's trusses. This deluge, when activated by either the flame detectors or the manual control stations delivers about 2000 cubic metres a minute of biodegradable high-expansion foam at an expansion ratio of between 650:1 and 700:1. Significantly, this means that the solution uses just one percent of the water that would be used by a comparable foam monitor installation.

The system simultaneously delivers a foam blanket across the hanger's entire 50-metre by 50-metre floor area at the rate of 0.85 metres-a-minute or 0.3 metres in 21 seconds, which FM Global tests show is sufficient to suppress a fuel spill fire. Even so, sufficient foam concentrate is held in the system to continue discharging throughout the hangar for 15 minutes, at which time the discharge is stopped automatically. A further 15-minute supply can be activated manually.

Two fire pumps are installed to ensure that an adequate water supply is available during pump maintenance. They are configured so that the second pump will start within five seconds if the first pump fails to start. These fire pumps are stopped manually. The foam deluge system controls are separate from the fire alarm system to



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Pollutants are not allowed to escape from the hanger. Liquids are collected in a drain and discharged into a collection tank.

Pic copyright Graham Collins

ensure the maximum operational availability of both systems.

Discharge of the foam ceases as soon as fewer than two flame detectors no longer register the presence of a fire. This ensures that the amount of foam discharged is the minimum required to extinguish the fire, which reduces the risk of damage to the aircraft, ensures faster clean-up and reduces the volume of liquid that will end up in the capture tank. However, in the unlikely event that the fire again breaks out, the manual controls enable the discharge to be recommenced immediately.

This inexpensive and reliable type of deluge system has several significant advantages over other hanger firefighting systems. The lightweight foam generators are hung directly in the supply pipes and reduce the weight on the roof; the pipes are not under pressure and water is not stored in the pipework – again reducing the weight on the roof; they have no moving parts and so cause minimal maintenance disruption in the hanger.

In addition to not requiring an electrical supply, they do not require external air for foam production – the system creates foam from smoke gases, smoke-contaminated air and hot air. This leads to a rapid decease in temperature in the room as the hot aired is cooled in the generators, where it is aspirated and sprayed with water from the generator nozzles. Smoke emissions are reduced and fire ventilation is unnecessary. These features combine to deliver an extremely cost-efficient solution and one, in the designers' view, that is the least-cost option for hanger protection.

The foam spreads horizontally better than foam from fan-driven generators that deliver higher expansion ratios, and an effective blanket is formed quicker with high-expansion foam than with either low-expansion or medium-expansion foams or AFFF foams. Additionally, the low water content of the foam will help prevent penetration of aircraft interior surfaces or into concealed spaces beneath the floor.

Indeed, the low water content of high-expansion foam makes its use very attractive to environmentalists and others concerned with water management. Australia is a country where water is a scarce commodity and securing water supplies and using water wisely are high priorities.

Foam Capture

To satisfy Brisbane Airport Corporation's environmental directive that no pollutants should be allowed to escape from the hanger, the hanger floor slopes towards a drain at the hanger door. Any liquids are collected in this drain and are contained in an underground tank beneath the fire pump house for licenced disposal off-site.

This tank has a capacity to store approximately 61 cubic metres; more than sufficient to contain the 49 cubic metres of a 15-minute foam discharge and any other drained liquids. This compares with traditional hanger fire protection systems that would require tanks with capacities of between 300 cubic metres and 500 cubic metres. A level indicator switch is incorporated to monitor the level of the liquid in the Five Star Aviation tank; when the capacity remaining approaches the 49 cubic metres required for a 15-minute foam discharge level a sounder indicates that the tank needs to be pumped out.

Maintenance Regime

Considerable care has evidently gone into the design to simplify maintenance and operability. For example, in addition to normal brigade isolation, a switch has been included to close the foam concentrate valve to ensure foam is not discharged during maintenance tests. When the deluge system is periodically tested, all tests are carried out with air to avoid unnecessary foam discharge.

Such is the system's simplicity that just three indicators and only two types of push button are required for operation.

Commissioning Test

A full-scale commissioning test was carried out in November, which was witnessed by both Brisbane Fire & Rescue and the airports ARFF personnel.

The pump house is located alongside the hanger. Pic copyright Graham Collins

To test the sensitivity and reliability of the triple infra-red flame detectors, a small fire pan was lit on the floor near the middle of the hanger. All four detectors, which were set at their lowest level of sensitivity, activated within 15 seconds of ignition. At normal sensitivity settings the detectors will operate within three-to-five seconds in response to a typical fuel spill fire.

Within 14 second of the deluge commencing, foam discharge had started from all 36 generators. A 20 to 30 second discharge would be required to suppress a fuel fire to the point where its flames would not be high enough to threaten aircraft above the fuel spill.

However, for this test, the fire pan had been slightly elevated above floor level and positioned in the most challenging position for detection and extinguishing, so it took a little longer to extinguish the fire in the pan. When this occurred, the flame detectors stopped registering the presence of a fire and the foam discharge ceased. The manual control buttons were tested to ensure that the foam discharge could be stopped and started manually.

The minimum design criteria required by NFPA 11 is 0.3 metres a minute with the hanger doors open. This allowance for leakage through the hanger doors and other openings varies according to the depth of the foam blanket, which could be as high as 12 to 13 metres after 15 minutes. The system was designed to flood the hanger at the rate of 0.85 metres-a-minute with the hanger doors closed. At the end of the test the mean depth of the foam blanket was 1.2 metres, equating to 0.9 metres-a-minute. **APF**

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Axel Topp

Nuremberg Fire Brigade

Fundamentals of Vehicle Extrication

This article describes briefly the fundamentals of rescue practice from on-scene arrival to freeing the trapped patient and handover to the emergency medical services.

Having arrived at the rescue scene and started to and set up, it is important not to hinder the quick arrival and exit path of emergency medical services personnel tasked with immediate transportation of a patient.

Safeguarding of the scene has to be organised taking into account the traffic situation and road type. In a position forward of the rescue scene, a large vehicle can be positioned to act as a buffer. The fire truck with the necessary rescue equipment should be located close to the crashed vehicle to minimise the travel distance for accessing equipment.

Another important point to remember is the so-called "space management". A perimeter should be established at the rescue scene with its boundary clearly marked. Within this perimeter there should only be essential personnel who are there to perform their duties on the accident vehicle. The staging area should offer the possibility to pre-position equipment and tool that are likely to be needed when working on the accident vehicle. A further staging area in the rear should be reserved for emergency medical services, where spine boards and other medical equipment can be positioned. A third staging area can be used for removed vehicle parts, located away from the accident scene.

Inspection

One of the first phases of the rescue operation is the vehicle inspection. The team leader and an assistant will examine the situation at the vehicle, looking for:

- First access possibilities.
- What is the patient's condition?
- Can doors and trunk to be opened?
- A first opportunity to communicate with the patient. This contact should be kept up during the whole rescue operation.

Additionally, a visual inspection underneath the vehicle is done to determine if fuel is leaking, or if there are any hints for alternative power sources built into the vehicle base, such as gas bottles. At the same time, particular kinds of glass, such as tempered or laminated safety glass, should be marked as later this will play an important role in terms of glass management.

Now we take a look at the inside the vehicle to determine what kinds of safety features can be identified? Is there one or more other person to be extricated?

Fire Prevention

Fire prevention should be undertaken early on. This can be accomplished most effectively with dry chemical extinguishers and a fire hose with a Class B foam additive. Fire prevention must be constantly monitored in case a potential fire hazard develops. Also, in instances where there is a gasoline or diesel leak, Class B foam will be sufficient to saturate these materials.

Stabilisation

Another safety consideration is supporting the vehicle to keep it from rolling. This is done by ensuring that a wedge or wheel chock is placed behind the tires. The vehicle is secured diagonally, front and rear. After this, the vehicle is stabilised in four places beneath the A and B pillars to prevent movement of the car body, using wedges and square-cut boards. When adopting these measures it is obviously important to ensure that the ground is hard enough to provide a strong and stable base.

When working on the bracing, try to avoid vibration. Any jarring of the vehicle incurs undue physical and psychological stress for the patient, and unused stabilisation materials should be removed from the staging area. Once the four pillar points are secured, air is let out of the tires. The best tool for this is a valve wrench, so that the vehicle can still be rolled later on.

Primary Access

During the patient care activities, it is essential that access to the patient is provided. The ideal way to accomplish this is via the rear trunk in order to circumvent non-deployed safety devices such as airbags. The primary access can be chosen during the glass management operations. Tempered safety glass is taped up so that shards of glass enter the interior as little as possible, as they could cause injury later. Now the glass can be centre punched to break the window.

Initial access to the patient should be fast so that baseline vitals are obtained and documented. A decision has to be made on the kind of rescue: non-critical; critical; or "crash". The patient is covered with a blanket and treated psychologically and physically. Side windows need to be opened. The window sill is then taped up to ensure that glass shards eventually do not get in the way when the door is removed later on. It is important that the patient remains covered and communication is on-going.

Glass Management

In case the glass is wet, a protective cover can be used to remove it in one piece. The responder holds the stretched blanket against the glass from inside while two colleagues grip the bottom edge so that it is tight.

The front windshield is made of laminated safety glass; it can be glued in or framed in by rubber. Removal of the front windshield begins with punching a hole in the glass and cutting it with a glass saw. Laminated glass causes a lot of glass dust; be careful not to inhale it. In consideration for the responder's own health safety, when removing glass, always wear a dust mask; this also applies for the responder working inside the vehicle. If the patient is not already wearing an oxygen mask, he or she also needs to be equipped with a dust mask.

Glass can be taken out as a whole or bent into a U form. The choice depends on medical priorities. When time is a critical factor in the rescue, glass is folded. If more space is needed due to medical care requirements, the glass needs to be removed completely.

The Airbag Rule

During a rescue operation, there is a high possibility that non-deployed airbags could be harmful. Keeping the airbag acronym, the so-called "Airbag Rule", in the back of our minds will increase our own safety.

A – I – R – B – A – G

A – Always keep a distance:

- Pay special attention to the 30 – 60 – 90 airbag risk zone rule.
- 30cm for head/door and side airbags.
- 60cm for driver airbag.
- 90cm for passenger airbag.

These are the airbag risk zones that we should keep away from and where rescue tools should not be used as unintentionally deploying airbags can convert them into a dangerous projectile. The use of air-bag-safes reduces the risk caused by late deploying air bags. Sometimes, working in the airbag risk zone cannot be avoided; however, time spent there should be kept to a minimum whenever possible.

I – Inspect the vehicle inside:

- A thorough inspection of the inside gives the chief responder an impression of components installed inside the car.

R – Relate the danger to other rescue personnel:

- As well as the fire and rescue team, other emergency medical service teams and the police will be present. They all need to be warned of on-scene dangers.

B – Batteries need to be disconnected.

- Whenever possible, disconnect batteries. Keep in mind that new cars models may have more than one battery on-board.

A – Attempt to disconnect the interior panels:

- Disconnecting the interior plastic panels will expose airbag unit locations and seatbelt pre-tensioner locations to ensure these components will not be cut.

G – Getting around dangerous components:

- Even deployed airbags can still be dangerous.
- A not completely deployed two-step airbag or a hot airbag inflator could be a risk.
- The deployed airbag textile material poses no threat.

Interior Plastic Panels

Inspection of pillars and assessing whether hybrid or cold gas generators are hidden behind the panels requires removal of the panels on pillars A, B, and C. It does not matter if the panels are dismantled on one or both sides, since the vehicle is constructed symmetrically.

With regard to the B pillar, it should be noted that all plastic panels extending to the floor of the vehicle need to be removed. Should there be difficulties dismantling interior panels, they can be lifted up to find out if hybrid gas generators, structural pillar enhancements, or adjustable seat belts are present.

Roof Removal

Mark out the appropriate spots where hybrid gas generators, structural pillar enhancements, and seat belt systems are located when attempting to completely remove the roof. By marking out where to cut – the so-called rescue plan execution – work for the cutting crew is made easier. The same work is done on both sides of the vehicle.

Batteries

The battery must be disconnected early on by initially taking a look under the hood of the vehicle. From outside one could dismantle the grill and pull the hood release cable. If this is not possible a spreader can be used to open the hood or other vehicle parts. If the batteries cannot be found, do not waste time for an extended search!

Handling Rescue Tools

We are coming to the "therapeutic opening"; in other words, an opening in the vehicle to provide immediate medical care to the patient. Gaining "therapeutic access" calls for hydraulic rescue tools.

When handling such tools there are a few things to be aware of. Operating hydraulic rescue cutters from the arm bend on an elevated part of the vehicle makes the job easier. Furthermore, it is important that, whenever possible, hinges are cut from the top and that the operator doing the cutting is not positioned between the vehicle and the rescue tool. Above all, it is important to keep a clean work area and return all rescue tools back to the staging area if they are not in use.

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Door Removal/Therapeutic Access (Reaching the Patient)

Removing a door by cutting off the hinges requires enlarging the gap. This is accomplished using a spreader to expose the hinges. One possibility is to perform a fender crush.

Now the door hinges are separated with a rescue cutter or spreader. Be aware when cutting, that the door latch mechanism is kept open. Keep the star grip valve "open" until the second pressure stage is reached. This means that movement of the blades or spreader arms will slow down. Only in this pressure stage does the tool apply its maximum performance. Cutters with round blades like the Lukas S 700 (E) have the perfect shape of the blades to work their way into the door fold and separate the hinges.

Final Roof Removal

One of the final phases before patient handover to emergency medical services is the complete roof removal. Cut the pillars going from D or C to A in the order of sequence (DD) C C B B A A. But before this can be done seat belts, all possible plastic panels and door sealing rubbers need to be removed. After taking off the roof, all sharp edges are to be covered before extricating the patient in the last step.

Relief Cut

In order to create more space in the footwell we can push away the vehicle front. A 45° relief cut has to be made. After that the door sealing has to be removed and measurement is taken to see how the rescue ram can fit. It is important to realise when pushing, that not only the A pillar, but also the entire front-end of the vehicle is pushed forward and the transverse link between the A pillar and transverse beam does not break.

If a rescue ram cannot be used, an alternative technique to push away the vehicle front is the "spreader method". Create a "footwell window" by two cuts to insert the spreader. If necessary weaken the car body structure by performing two parallel relief cuts at the front frame rail. Reinforcements at the centre console need to be laid open and weakened if required. Push the vehicle front away with the spreader.

The patient is considered ready to extrication, when the steering wheel edge is removed more than 10 cm from the patient. Now the patient can be placed on a spine board and handed over to emergency medical services personnel.

Patient Extraction

To get the patient out of the vehicle and hand him or her over to the emergency medical services, a spine board can be used. This allows an axis-controlled rescue after taking off the roof.

There is one person beside the footwell observing the patient's feet and ensuring that they will not get stuck during extraction. Two of the tallest crew members are standing at the B pillar manoeuvring the patient onto the spine board. It is important that the patient is hoisted and not pushed. Both men should be of about equal height. Two responders standing back are holding the spine board, but will in no way push it beneath the patient's spine. Way in the back are two more responders who will be taking charge of the patient once he or she is put on the spine board.

Now the patient is handed over to medical services. APF

Axel Topp is Brandoberinspector at Nuremberg Fire Brigade

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Video Image Detection:

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Alan Locke

Fike Safety Technology

All of us recognise fire when we see it – we know what a fire looks like so this is, for us, a reliable method of fire detection. The same idea is the basis for video image detection, a fire detection technology currently creating a lot of interest. But how does an automated system reliably detect fires simply by looking for them?

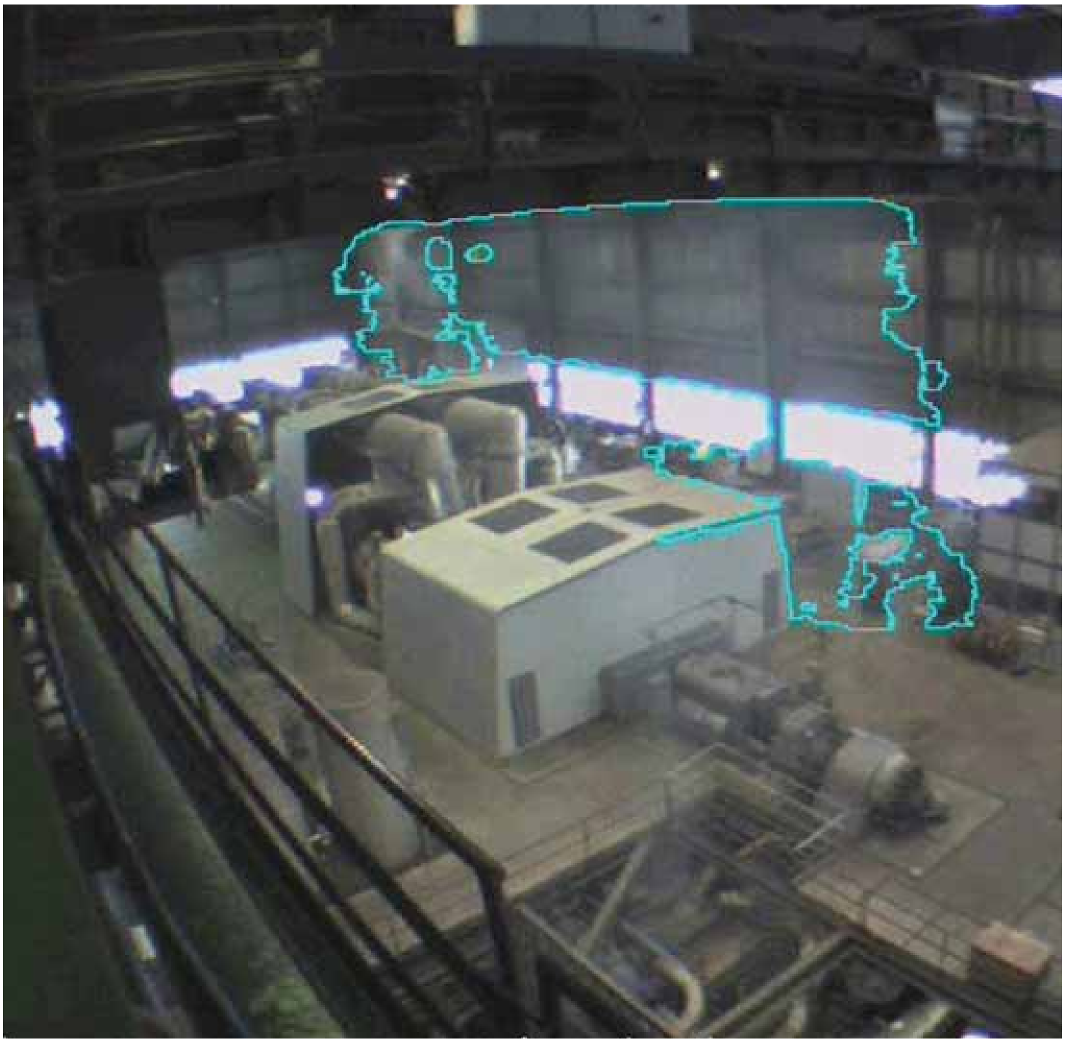
While conventional fire detection systems rely for their operation on a variety of heat, flame and smoke sensors, the sensor used in video image detection (VID) systems is a CCTV camera of a type similar to (though not necessarily identical to), those used in security installations. And the way that VID systems operate is, in principle, very simple. One or more CCTV cameras capture images of the protected areas, and these images are then analysed using sophisticated algorithms that look for the tell-tale signatures of a fire.

The exact details of the algorithms used are proprietary, but the principle can be readily explained. Like all video images, those captured by the cameras used in VID systems are made up of a large number of picture elements or pixels, arranged as a rectangular array similar to the grid of a crossword puzzle. In a typical VID system, the grid has 640 pixels horizontally and 480 vertically.

The algorithm analyses this 640×480 pixel frame (over 300,000 pixels) 15 times a second. The data used by the algorithm is the luma value of the pixel, or how bright that pixel is. It uses a digital signal process to track each pixel location over time, so in one second the algorithm has read the luma value of over 4.5 million pixels. If the pixel location stays bright for those 15 frames it is given a high static brightness value; if the pixel location flickers bright/dark at the frequency of fire flicker it is given a high dynamic brightness value. This normalised data is constructed into a pattern every second and then fed to a neural network that has been trained on thousands of patterns of actual fires and nuisance events. If the pattern of a bright core at the bottom with a flickering corona near the top matches the trained neural network for four continuous seconds, then a flame alarm is generated. The same type of methodology is used for smoke but with obviously different pattern matching algorithms.

While this approach to fire detection may seem unfamiliar, it offers a number of very important benefits. Let us start by looking at fire protection, considering first a conventional installation, which is likely to include smoke detectors as a primary component. While these are reliable and useful devices, they have an important limitation – they cannot react until the smoke reaches them.

In a high-bay warehouse or even in the tall atrium of a modern building, it can easily take several minutes for the smoke from a fire at low level to reach a smoke detector high in the building, by which time the fire has already become established and likely spread to other parts of the facility. In fact, in some applications conventional smoke detectors will never respond.



For example, in cold storage applications, the smoke is chilled as it is produced and never rises to high enough levels to register with typical smoke detectors.

Of course smoke detectors are not the only type of conventional detector. Heat detectors are also popular, but have a similar limitation; they cannot react until the heat from the fire reaches them, which typically takes minutes rather than seconds. There are also specialised detectors such as air aspirating types, but these are more complicated and costly to use, especially if large volumes are to be protected.

With a VID system there is no need for the smoke from a fire to reach the camera in order for it to be detected – as long as the camera can see the fire it can react immediately. It might be argued that projected beam smoke detectors offer similar benefits, but in reality they provide limited area coverage and are often difficult to install because of obstructions like light fittings and building structural members.

It is also important to remember that the VID system looks for flames and smoke, so it can react to fast flaming fires almost instantly, before any significant amount of smoke has been generated. Speed of reaction is an important benefit of VID systems. In research carried out on behalf of Fike, the typical response time of the VID system to a flaming fire was around three seconds. In contrast, smoke detectors took 25 seconds, and heat detectors did not respond until between three and four minutes after ignition of the test fire. In fact, the VID camera does not even need a direct view of the flames to detect a fire. It will also respond to reflected light from flames, effectively allowing it to “look around corners” and beyond obstructions.

VID systems provide very economical protection for large volume enclosures. Protecting a large distribution warehouse or sports facility with a conventional system may require dozens of smoke and/or heat detectors, but with a VID system two or three cameras are almost always enough to do the job. VID systems can also be used outdoors, where providing protection with a conventional system is almost impossible. For example, monitoring waste bins near schools and industrial units, which are frequent targets for arsonist attacks.

VID fire detection offers special benefits in roof voids, especially where access is limited such as with historic buildings. If an ordinary detector is triggered in such a void, it is difficult to confirm what is going on. Is it a false alarm or is there a real and possibly very serious problem? With a VID system, these questions can be answered instantly, simply by looking at the images from the VID camera.

Since even the largest VID systems require only a relatively small number of cameras, they are much easier to install and to maintain than conventional systems. And of course, in these cases, installation costs are much lower. A VID system can also operate as a security CCTV installation, while simultaneously performing its primary function of fire protection. A VID system can provide video recording, as well as remote and local monitoring of live and recorded images, just like a standard CCTV installation. The need for a separate CCTV system for security purposes may be eliminated, representing a substantial cost savings in installed equipment, but also throughout its life as there is only one system to service and maintain instead of two.

How well do VID systems really work in practice?

To help provide a definitive answer to this question, Fike commissioned independent research carried out by a respected organisation with long experience in the fire protection sector. The research involved 63 tests where the effectiveness and speed of response using VID technology was compared with an air-sampling detector, a projected-beam smoke detector, spot-type ionization and photoelectric smoke detectors and a linear heat detector. The VID detector used for these tests was a standard unit from the Fike Signi*Fire* product offering.

With a video image detection system there is no need for the smoke from a fire to reach the camera in order for it to be detected – as long as the camera can see the fire it can react immediately. A VID system looks for flames and smoke, so can react to fast flaming fires almost instantly, before any significant amount of smoke has been generated.

In every test, the VID unit detected the fire and, in 61 of the 63 tests it was the first detector to respond. The only other detector to respond to all of the fires was the air-sampling unit, and this responded significantly more slowly in all but one of the tests. It is clear from these results that VID technology is both versatile and reliable.

As we have seen, VID technology has many attractions and benefits, but not all VID systems are the same. In fact, there are two main types. The first uses standard CCTV cameras and can, in some instances, even use existing CCTV cameras that are already in place for security or other purposes. The cameras work in conjunction with a digital video recorder and VID software that analyses the images from them to identify fire signatures.

This type of system can work well and is potentially a very economical solution where suitable cameras are already installed. It is, however, essential to understand its limitations. The most important of these is that, if the DVR or the software that is being used for the VID image analysis crashes, the whole fire protection system becomes ineffective. Another issue is that existing cameras are unlikely to be wired with fire-resistant cables, which means that the system may not meet regulatory requirements. And if new cameras are being installed, the need to use fire-resistant video or network cabling will significantly increase costs.

The second type of VID system uses dedicated cameras that have built-in image analysis capabilities of the type described earlier. These cameras are usually linked via an IP network to a network video recorder (NVR) at a monitoring station where their images can be used for security purposes. Crucially, however, they have a separate contact-type output that operates if they detect a fire, and this can be linked directly to a fire control panel.

The key benefit of this arrangement is that if the network or the NVR fails, each of the cameras continues to function as a fire detector and each can still send an alarm signal directly to the fire control panel. Another benefit is that, as the network cabling does not play an essential role in the fire detection function, fire-resistant cable does not have to be used. Standard inexpensive and readily available CAT 5 network cable is perfectly adequate. The only wiring that may need to be fire-resistant is the twin cable connecting the camera's alarm output to the fire control panel.

A further benefit of this arrangement, with its use of network technology, is that it is easy to arrange for the images produced by the system to be monitored remotely, off-site or even in another country, by using Internet links. For big companies, this opens up cost-saving options for central monitoring of multiple sites.

It is worth mentioning that VID technology, in addition to being an excellent choice for providing fire protection in buildings, can have other slightly less conventional applications. An example relates to a machine used to manufacture abrasive pads. One stage of the production process involves baking these pads at a high temperature using an infrared heat source and, from time to time, the adhesive used in the pads catches fire. This is not a particularly dangerous condition, as the machine is built to contain and withstand these small fires, but it is necessary to stop the machine and draw the operator's attention to the problem as soon as possible. VID technology, using a dedicated camera with an alarm output, is an ideal solution. The camera does not have to be accommodated within the machine itself, which is quite difficult – the camera just needs to be mounted where it can see the area where the fires occur. In the event of a fire, it provides an almost instant response to the flames.

The introduction of VID technology is arguably the biggest step forward in fire detection for decades, yet it is only natural for specifiers and end users to have some reservations about a system that is so innovative. Hopefully this article demonstrates the benefits VID can offer and that in many applications, these advantages are unmatched by any other currently available method of fire detection. APF

Alan Locke is Head of UK and Export Sales for Fike Safety Technology

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Marine Fire Fighting – A Land Based Paradigm

John Jugum

Metropolitan Fire and Emergency Services Board

Fire brigades around the world have developed a range of specialisations to deal with the increasingly complex situations with which they are confronted in light of growing community expectation. Urban search and rescue is one such example and few would argue its value. However, the marine environment poses special risks for land based agencies and in the context of increasing shipping, port throughput and value of cargo it is imperative that the question of community expectation and response be addressed.

This article will touch on some of the work that is currently being undertaken in Melbourne, Australia and comment on a national approach for addressing the perceived disparity between expectation and reality of response.

To quote Infrastructure Australia 2010, "Australia is an island whose place in the international economy and whose productivity, living standards and quality of life depend on trade performance. As a maritime nation, ports are an important gateway for goods and for our defence. Consequently, ports and associated infrastructure are of the utmost economic and social importance to Australia".

Ports represent interfaces between the sea and land where goods are transferred to and from ships. They require sophisticated infrastructure such as road and rail links with some ports catering for passengers. Ports can generally be categorised into bulk export, metropolitan (containerised goods) or mixed cargo sector ports.

Australia has experienced increased shipping in spite of the global financial crisis (GFC) with exports to Asia accounting for more than 72 percent of export trade. In 2010, Aud$129.5 billion of trade was exported to Asia alone making up 11 percent of Australia's gross domestic product (GDP). The GFC has seen economies all over the globe plummet into recession with economic growth stagnating. Australia has been largely protected from the economic downturn by mining industry exports that have continued to grow during this period. According to the Bureau of Infrastructure, Transport and Regional Economics,

2011: “In 2009 -10 there was a 14.4 percent increase in the total weight of exports and a 4.9 percent increase in the total weight of imports”.

The importation of manufactured goods has increased significantly over the past decade putting added stress on containerised ports throughout Australia. Record throughputs in containerised goods have been recorded in Melbourne, Sydney and Brisbane. The Port of Melbourne is the busiest of these ports and accounts for approximately 38 percent of Australia’s container trade with approximately 2.5 million six-metre equivalent units moving through its port annually. This growth is expected to continue with Australia’s bulk commodity exports and metropolitan container imports expected to double in size every ten years.

Add to this increased visits by cruise ships and we begin to get a picture of an expanding and growing risk to fire service traditional land-based response models.

Future Context

In January 2011 Australia’s Prime Minister and the Minister for Infrastructure and Transport released the National Ports Strategy aimed at creating a coordinated approach to planning for ports and their associated road and rail links. The Bureau of Infrastructure, Transport and Regional Economics (BITRE) prepared a report in 2010 that predicted maritime activity to 2029 – 2030. These two important documents provide the framework for future growth in the ports sector. Predictions are that vessel activity will increase across all sectors from a total of 27, 434 calls to Australian ports in 2007/2008 to 38,380 by 2029/2030. In economic terms this represents a significant increase from current values with a doubling in trade predicted every ten years.

Throughout Australia ports are increasing their size and capacity to meet current and future growth. The state of Victoria’s Premier recently announced an Aud$1.2 billion redevelopment of the Port of Melbourne that would ensure it had the capacity to meet future needs. This redevelopment includes the addition of another container terminal that will help cope with demand in the medium term as 72 percent of throughput is containerised. The development across all jurisdictions in ports and their associated infrastructure continues in order to meet both current and future capacity.

Fire Service Context

Fire services deliver public value through the provision of emergency services to meet community and government expectation. They are an essential component of a safe and secure society and operate using traditional and known methods. Yet the task they face in dealing with the expanding maritime environment and associated infrastructure is enormous and will require considerable resources to ensure risks are mitigated.

This is made all the more challenging given recent budget cuts experienced by fire services across Australia. This presents what has been described as an “adaptive challenge” that offers the opportunity to change the approach and methodology of dealing with the issue. An adaptive challenge can be thought of as one requiring change to people’s current values to meet the reality with which they are faced. For example, new methods may be required rather than a reliance on the existing paradigms.

Fire services have traditionally approached ship fires as large complex structure fires and this can be a valid method for dealing with fires on vessels. However, ships pose special risks and require specialised knowledge and training to deal with fires effectively and safely. The United Kingdom’s Marine Incident Response Group (MIRG), a co-ordinated group comprising specialised firefighters drawn from 15 coastal brigades, classifies response to emergencies on board vessels into three categories; level 1 relies on using on board resources, level 2 relies on the ship’s master calling in fire service support, and level 3 relies on the use of salvage companies. However, the MIRG has recently had its budget removed as part of the United Kingdom’s austerity measures resulting in brigade intervention occurring only when ships are docked.

The International Maritime Organisation (IMO) is a peak body that is the United Nations’ specialised agency responsible for improving maritime safety and preventing pollution from ships. The IMO publish the Safety of Life at Sea (SOLAS) international treaty that specifies minimum standards for the construction, equipment and operation of ships, compatible with their safety. This includes specifying basic firefighting training for ships crews. Ships masters and senior officers are generally considered experts regarding ships under their command. However, there is a role for the fire service to play when incidents escalate beyond on-board capability. In these situations it is essential that the most appropriate actions are taken including consideration on the likely impact to operational ports. A joint approach that may include use of on board personnel could be beneficial.

Just as other specialised responses have been developed to meet public expectation brigades must now seriously consider marine response as an area requiring enhanced skills and equipment. The economic value of trade and the life safety risk posed by increasing cruise shipping operations is simply too high to ignore.

International Context

NFPA Standard 1405 sets out training requirements for land-based firefighters that respond to the marine environment. It covers a number of areas land-based firefighters should be trained in to adequately and safely perform their duties.

The MIRG in the UK is generally regarded as a model of best practice but, following its recent funding cut, a new model has been introduced whereby ships at sea are assessed and directed to a port of refuge without direct brigade action until arriving in port. Assessments are done by commercial salvage companies. No funding exists to maintain the coordinated fire service approach with the capability of boarding ships at sea to intervene.

Melbourne Experience

The Metropolitan Fire and Emergency Services Board (MFB) has a legislated responsibility for fires and hazardous material incidents within Port of Melbourne waters that includes over 1000 square kilometres of Port Philip Bay. With limited water-borne capability of its own, agreements with towage operators have been in place for several years to provide firefighting services. However, port throughput has increased substantially over the past decade. Shipping and recreational traffic has also increased substantially as has the development of waterside marinas and apartments. Cruise ship visits have also risen to around 50 a year.

The response by the MFB has been to develop a capability in marine firefighting. In 2008 the Office of the Emergency Services released a report titled "*Marine Emergency Framework Review*". This report made a number of recommendations for emergency services including: "…that emergency services increase their capability/capacity to respond to marine emergencies by undertaking the necessary training, increasing their awareness of port and ship operations and ensuring knowledge of the roles/responsibilities of the relevant authorities and stakeholders."

A specialised course in marine fire-fighting has been developed and is currently being delivered to experienced firefighters over a two-week period. This course adheres closely to NFPA 1405. The course includes a two-day component at the Australian Maritime College in Tasmania and will see over 100 marine firefighters trained. These firefighters will be placed at fire stations in close proximity to the port infrastructure around Melbourne. Equipment and water-borne support for these firefighters is still under development with the intention of adding vessels to support operations.

The MFB has also appointed a marine commander to oversee the marine operations and provide continuity across the portfolio. The MFB is currently constructing a purpose-built training facility that will include a state-of-the-art marine firefighting prop capable of delivering a number of hot-fire training simulations.

National Approach

In the wake of the rapid growth in ports, a national approach from fire agencies seems sensible. Individual organisations faced with responding to emergencies in the maritime environment are vulnerable as they lack the resources to adequately build sufficient capability and expertise.

The Australasian Fire and Emergency Service Authorities Council (AFAC) is the peak body for public sector fire, land management and emergency service organisations in Australia and New Zealand and is well placed to begin development on a national policy covering the marine environment. This policy should cover areas of response from member agencies including mutual support. However, it must also include measures to improve input into national infrastructure development. In this way a concerted effort to gain maximum return on investment and provide relevant measures to address community and government expectation of fire services given a marine incident can be provided. A national response and expertise model, finance, training, risk assessment process, fire safety and coordination arrangements should be considered.

Importantly the Australian Maritime Safety Authority (AMSA) is a largely self-funded government agency with the charter of enhancing efficiency in the delivery of safety and other services to the Australian maritime industry. Fire agencies through AFAC must formalise a relationship with AMSA to capitalise on their expertise and possibly seek funding to support a national model. With a staggering Aud$178 billion in annual trade going through the ports it seems feasible to achieve some contribution in line with the expected growth.

Summary

Australia considers itself a well-developed and progressive country with a strong economy. One of the strengths of its economy lies in its natural resources and being able to ship them internationally. With increasing trade come increases in infrastructure and ship movements that can increase the likelihood of incidents occurring. Without adequate planning for such events economic prosperity can be jeopardised and fire services exposed to considerable pressure and reputational damage. Worse still fire agencies can be compelled to respond without proper training and support increasing the likelihood of disastrous consequences. Fire agencies have the opportunity to get organised and address these issues by developing a national marine policy that formalises relationships and seeks funding to increase public value in line with what the community and government would expect. **APF**

This article is based on a presentation made by John Jugum at the AFAC/Bushfire CRC 2012 conference.

John Jugum is District Operations Commander North West Metro Region/ Central District at the Metropolitan Fire and Emergency Services Board

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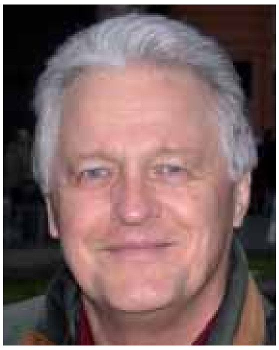
A TetraKO fire test

What's Water Enhancement All About?



Graham Collins

Water enhancers were much in evidence and attracting a lot of interest earlier this year at the exhibition that accompanied the 2012 AFAC/Bushfire CRC Conference in Perth Australia. But what are these enhancers, and how do they work? Two of the best known are TetraKO and Thermo-Gel, so perhaps we will get a better understanding of the where, why and how of enhancers by taking a close look at these two options.

Water Enhancers – What are they?

According to its manufacturer, TetraKO transforms ordinary water into an adhering gel. It is claimed to be far superior to water, super absorbent polymer based suppressants, and Class A foams. TetraKO is bio-based, and independently certified non-toxic and biodegradable.

Thermo-Gel is a water enhancing polymer concentrate that its manufacturer says maximises the efficiency of water being used to fight fire or protect valuable assets. Its Thermo-Gel 200L is sold as a liquid concentrate, while Thermo-Gel 500P is a granular version.

How do they Work?

TetraKO's proprietary dual thickening agent allows it to adhere and stay where applied. When heated by fire, it becomes even thicker and releases a cooler dry steam, dramatically aiding in fire suppression. It is reckoned to be the first product of its type that contains no super absorbent polymers. TetraKO easily mixes with water using a turbo mixer system. The resulting solution is offloaded to fire apparatus, skid units and the like. There is no need for a costly foam pump or proportioning system, and it can be applied to wildfires from air, truck or backpack.

Thermo-Gel, when added to water, forms a heat absorbing gel. This gel adheres to any kind of vertical or horizontal surface, creating a protective barrier against fire. It can also be used as a method of direct attack, to extinguish and bring fires under control quickly and effectively while saving time and water.

Thermo-Gel protection for structures

What are the Benefits of Using Enhancers?

The main benefits for TetraKO are cited as being:

- Faster and effective knockdown than water, traditional Class A foam, and compressed air foam or gels.
- Heat Reduction. TetraKO consistently drops the upper thermal layer of heat 50 percent, on average, in under 15 seconds,
- Effective suppression by reducing heat, removing the fuel source and oxygen.
- Reduced rekindling by providing a blanket of fire protection.
- Reduced water damage by reducing the amount of water required to extinguish the blaze.
- Certified Earth Friendly. TetraKO's mixed solution is certified as "ready biodegradable" and non-toxic to water, fish, plants and mammals.
- Easy Cleanup by simply rinse tanks and hoses after use. There will be no residue and no environmental footprint once the product evaporates.

The main benefits for Thermo-Gel are given as:

- Providing hours of protection for structure, equipment and property.
- Clinging to all types of vegetation and vertical surfaces, including glass.
- Excellent performance as a suppressant on all types of Class A fires.
- Being sunlight degradable, non-toxic, non-corrosive, and environmentally friendly.
- With Thermo-Gel 200L not requiring batch mixing.

What are the Main Firefighting Applications?

For wildland firefighting, TetraKO can be used when directing an attack on the head of the fire, laying a wet line on the ground, or a retardant line from the air. It provides protection for sensitive fuels and structures. Once applied, TetraKO sticks and stays, and will not fall to the ground, creating a non-toxic fire protection barrier for all types of grasses and other sensitive fuels.

Thermo-Gel is used in fire engines, helicopters and air tankers for direct attack to suppress forest fires, and to establish fire protection lines ahead of a fire. It is also used to protect homes, structures, utilities' poles and other assets. It can be used on hard to extinguish fires such as vehicle, tire, and hay bale fires. Thermo-Gel also has other applications, including sprinkler devices for industrial/commercial use and homeowners.

To Which Standards and Codes do they Apply?

TetraKO has earned the USA's Environmental Protection Agency's Design for the Environment recognition under the new Industrial/Institutional product category "Fire Fighting Product". It has also been independently certified as non-toxic to mammals, and non-toxic to aquatics, including fish.

TetraKO is applying for US Forest Service approval to be placed on its Qualified Products List (QPL). It has been tested and has passed all requirements of NFPA 18A (with the exception of the miscibility test, which is designed for a liquid concentrate versus TetraKO's powder alternative) and is certified under NFPA's uniform corrosion requirements. The technology is currently undergoing testing with the Netherlands' fire command, and is about to commence testing in the United Arab Emirates.

Thermo-Gel meets the US Forest Service specification for water enhancing gels, Specification 5100-305A, as well as NFPA 18a. The product is approved for use in Single Engine Air Tankers (SEATS), helicopter buckets, and engine ground use. Thermo-Gel has also been approved for use in Canada, Australia, and Mexico; it has been tested by Cal Fire (California's Department of Forestry and Fire Protection) and FERIC (Forest Engineering Research Institute of Canada).

Where are they Available in the Asia Pacific Region?

TetraKO is available in South Korea and the company expects to shortly add New Zealand. Live fire burns have been conducted in Japan and TetraKO will again be at the AFAC/Bushfire CRC Conference in Australia in 2013.

Thermo-Gel continues to expand its international customer base in Malaysia, South Korea, and Australia. **APF**

Aerial application of TetraKO

For further information, go to www.earthclean.com and www.evonik.com

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The app aims to assist those who intend to prepare for a bushfire by putting them in the right frame of mind to convert intentions into actions. (Pic courtesy of Queensland Fire and Rescue Service)

Emotional Bushfire Preparedness in Your Pocket

Nathan Maddock

Bushfire CRC

A team of Bushfire CRC researchers are helping residents of bushfire-prone areas prepare for a bushfire by modifying their thoughts using an iPhone app.

Researchers have developed an iPhone application to help people exposed to the risk of a bushfire engage more actively in bushfire preparedness. The study is led by Professor Colin MacLeod from the University of Western Australia's Centre for the Advancement of Research on Emotion and is funded by the Bushfire CRC. It seeks to help residents of bushfire prone areas effectively follow through on their intentions to undertake bushfire preparedness work.

It is aimed to achieve this modification of thought through an iPhone application that trains selective attentional response to information related to the threat of a bushfire.

"The application will assist people who want to do something to reduce their individual bushfire risk, but who find themselves procrastinating about actually taking the steps they need to in order to enhance their safety," says Prof MacLeod. "These people really do intend to complete bushfire preparedness jobs around their home, but the way they processes certain types of information means that that their intentions to complete these tasks do not get realised. For these people, we have designed the application to produce and maintain the emotional state that will help them follow through with their plans, to complete the tasks they know they need to do."

The application works by measuring the user's response to words that appear on the screen. Some of these words relate to bushfire and are designed to influence emotion, while some are not. The user must respond to the words by pressing the appropriate prompt. The quicker this is achieved, the higher the score. Attentional bias is indicated by the response time.

The approach Prof MacLeod and his colleague, Dr Lies Notebaert, a postdoctoral fellow also funded by the Bushfire CRC, are using is known as cognitive bias modification, and their research falls under the Bushfire CRC's *Communicating Risk* program.

Cognitive bias is simply selective information processing, and cognitive bias modification works by changing the types of information an individual focuses on, and the way in which it is used.

Prof MacLeod describes this as training the brain. "Over a period of time, the brain can be trained to adopt a particular pattern of processing, by extended practice, completing tasks that encourage this pattern. If we run people through these tasks, even for a relatively short period of time such as 15 to 20 minutes, we can change how people think, in ways that may influence emotion and motivation.

He continues: "By altering the way people process information when they intend to complete particular actions, cognitive bias modification delivered through a smartphone application may be able to be assist in the degree to which they follow through on these intentions, even after a single session of around 20 minutes, so long as it is given at the right time."

By using a smartphone application, the individual is able to choose when the right time is for them, such as when they wake up on a Saturday morning.

The work on smartphone-delivered cognitive bias modification has drawn inspiration from Prof MacLeod's on-going collaboration with Professor Rich McNally at Harvard University. He says; "Rich and his PhD student, Phil Enock, recently developed the first iPhone application of this type, and their pioneering work has opened up the new frontier we are now exploring."

Prof MacLeod and Dr Notebaert are hoping their smartphone application might give people the ability to put themselves into the emotional state that is optimal to maintaining the motivation to follow through on their intentions.

"We all regulate our emotions. When we feel threatened, we take steps to reduce the degree to which we feel anxious. One easy way to do this is by putting unpleasant thoughts out of mind, and avoiding thinking about the threat, rather than by taking effective actions that effectively reduce this threat. Burying one's head in the sand can be an effective way of regulating negative emotion, but this short term emotional benefit comes at a significant cost," says Prof MacLeod.

People who maintain positive emotion by avoiding thoughts about threat can find themselves underprepared when there is a genuine danger that requires good decision making and effective action. In a bushfire scenario, being underprepared can be deadly. At the other extreme, some people may be so worried about the possibility of danger that they fail to distinguish a relevant threat from an irrelevant threat. This presents a different issue that can also disrupt effective preparation for a bushfire.

"The problem here is that worry becomes over-generalised and unfocused. It may be triggered initially by identification of a particular risk that in principle could be prepared for, but the worry expands to include too many other concerns. Consequently, worry never stays focused on a specific threat for long enough to motivate completion of preparation behaviours that reduce this threat. Excessive worry of this type is not conducive to the effective planning and preparation required of people who live in bushfire prone areas, to ensure the safety of themselves and their families," adds Prof MacLeod.

While there are similarities between cognitive bias modification and talking with a psychiatrist or psychologist, there are also important differences between the approaches.

"Both cognitive bias modification and conventional clinical approaches employed in psychiatry or psychology focus on how people think. The difference is that cognitive bias modification is designed to retrain the brain so that it produces different types of thoughts, whereas traditional clinical approaches focus on changing how people respond to the types of thought they experience," he explained.

Prof MacLeod and Dr Notebaert identified during the earlier part of their project the patterns of information processing that lead people to most effectively engage in good preparatory behaviour, that reduces their exposure to bushfire danger. This work sampled participants from early 2011 fire-affected communities in Western Australia who reported differing levels of anxiety and worry, assessing a range of cognitive biases in attention, interpretation, memory and mental imagery.

The results of this study are enabling Prof MacLeod and Dr Notebaert to identify which forms of cognitive biases are linked to good preparedness behaviours. This will allow them to undertake subsequent studies, in which cognitive bias modification is used to improve bushfire preparedness.

The research is now progressing to the next logical step says Prof MacLeod.

"Now that we know the styles of information processing that produce the most effective behavioural actions, we are seeking to train these styles using cognitive bias modification techniques. Clearly, it will be of significant practical value if this training can increase engagement in behaviours that reduce risk, not only for people exposed to bushfire threat, but also for those facing other types of threats that can be reduced by good preparation."

The application will also be progressed. Currently restricted to the iPhone, there are plans for it to be developed for other smartphones.

Damien Killalea, Director Community Safety at the Tasmania Fire Service is the lead end user for the Bushfire CRC *Managing the Threat Through the Modification of Thought* project. He sees the research as highly beneficial, and is excited about the opportunities it may present.

He comments: "The smartphone application may give us the opportunity to introduce into people's homes a useful tool to modify the way they think about how bushfire preparedness is causing them stress, worry or anxiety. Our hope is that they will be able to modify their behaviour and act in a more appropriate way to the environmental cues, advice or warnings they receive about bushfire risk or the imminent threat of bushfire."

Mr Killalea knows there could be benefits on different levels. "For some people, modified behaviour may increase their attention to a level that will motivate them to act. For others, it may be a means to reduce their stress and worry to a level where they can take effective action, either to prepare for a fire or to respond to it. A smartphone application is a completely new opportunity for the sector, a new way to reach those at risk. An app is non-intrusive, and allows people to adjust the way they think about bushfires, and hence respond to them, in their own environment and in their own time."

Prof MacLeod acknowledges that the research is unusual. "Our approach is a bit different from what people might expect to find in bushfire research. But we are seeking to achieve the same outcomes as many other researchers and practitioners working to enhance community safety, using a different approach. We are trying to help people effectively complete safety preparation tasks they intend to carry out, by using a smartphone application that can put them in the right frame of mind to convert these intentions into actions."

More information about this research can be found by visiting the Managing the Threat Through the Modification of Thought page on the Bushfire CRC website at http://www.bushfirecrc.com/projects/6-3/managing-threat-through-modification-thought. **APF**

Nathan Maddock is Communications Officer at Bushfire CRC

For further information, go to www.bushfirecrc.com

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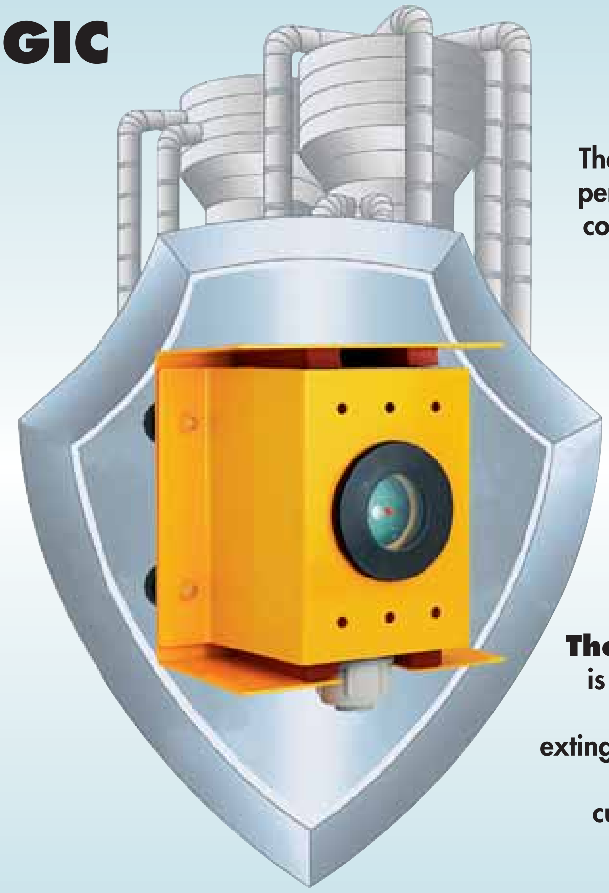

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Saturday, August 25, 2012 – Fire rises over the Amuay refinery near Punto Fijo, Venezuela. The huge explosion rocked Venezuela's largest oil refinery, killing 48 people and injuring dozens.

AP Photo/Ariana Cubillos

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Pic courtesy of Williams Fire & Hazard

Emergency Response

In the event of a major incident, will your brigade Respond or React?

Brent Gaspard

Tyco Fire Protection Products

Fools rush in where angels fear to tread! Witnessing the ferocity of any given industrial fire incident, one may think that running into the scene is foolish. However, when you have prepared for the moment and your training has developed your skills to properly anticipate and respond with discipline, it is not foolish – that is our job!

Certainly it takes courage; but not blind courage. Industrial fire response takes confidence – confidence that comes from experience, training and planning. Experience and training provide vital reinforcement of observations and muscle memory for individuals' actions and team coordination. Your most important work as a fire professional is planning, training and preparation.

When confronted with a dynamic emergency situation, reactions are unchecked and fuelled by emotion, whereas advanced preparation guides our responses with intelligence so we may move with purpose – assured of the outcome. A planned response allows firefighters to act from a position of confidence rather than from a weaker state of anxiety. Professional response operations will deliver coordinated targeted actions that will produce specific predictable results based on knowledge of fire dynamics.

Williams Fire & Hazard Control has said many times that a responder's greatest resource is his brain. The devil is in the details and a skilful fire brigade will be thoughtful and deliberate in its approach to both the simplest and the most complex emergency scenarios. It is this controlled effort that will maintain the composure of the team in the face of chaos, maintain its safety, and offer the greatest chance for success.

Too often the excitement and adrenalin of an event can cause firefighters to react to what the fire presents them rather than to walk patiently through the checklist of a planned response that is designed for the situation at hand. A prompt response does not always yield the proper response, as haste often does make waste of both energy and resources when reactions command the scene.

Before engaging precious resources, incident commanders must know team capabilities as well as the durability of its response provisions. Proper situation analysis should inform immediate, contingent, and long-term response requirements. Once incident commanders properly assess a situation's immediate and long-term impact, they can chart a response based on one, two, even three moves ahead — all while monitoring contingencies as the incident unfolds. Taking this long-range strategic approach will better ensure that tactics are

Pic courtesy of Williams Fire & Hazard

measured, efforts are focused and resources are best managed for containment, extinguishment, and follow-on suppression requirements that may be necessary. Remember, the same precious foam that puts out the fire can also be wasted through misguided application.

Today's storage industry is being operated at capacity that is increasing the value of these storage assets. As tank spacing is also often inadequate, when a facility experiences a tank fire with nowhere to move the product, failed extinguishment efforts may soon lead to a multi-target incident as one burning tank impinges and lights neighbouring tanks. These contingent extinguishment scenarios should be factored.

Upon a successful extinguishment, if the product cannot be offloaded and remains in the affected tank a drawn out process of continued foam applications for post extinguishment vapour suppression ensues. How many days of these foam applications will local foam stocks support?

Assets Necessary for Tank Fire Extinguishment

An example scenario of a marine terminal sees bulk storage batteries adjacent to river traffic, rail spur, highways and a local industrial corridor. Among the storage tanks are many large diameter tanks mixed in with smaller tanks. The area is congested and certain tanks may not be easily accessible from land or water.

If one of the larger tanks goes "full surface" (fully involved fire), many factors must be weighed as onsite command prioritises response targets, tactics, and durability of resources:

- First, the involved tank's position amidst neighbouring tanks is a priority to avoid "extension" or spreading of the fire to adjacent tanks due to heat loads. This becomes our first demand on water resources, hose runs, pumping operations and of course manpower.
- Next, the burning tank is addressed. What is the water and foam required to extinguish the tank? Is there enough foam on hand to attack the tank once, twice, three times?
- What if the attack fails and impingement from the tank lights another tank or BLEVEs (boiling liquid expanding vapour explosion) a nearby pressure vessel?
- If extinguishment is successful, and a good deal of product remains in the tank following extinguishment, vapour suppression must be maintained until the product is offloaded and the tank is secure.

Taking a closer look, let us assume this transfer process will consume three days. A foam blanket must be maintained on the exposed product for vapour suppression throughout that 72-hour period. If in this example 500 gallons of foam are required to foam the surface of the exposed fuel surface once and the resulting foam blanket lasts for two hours, 36 foam applications will have to be produced until such time as the product is moved and the tank is secured. Just these follow-on applications will require 18,000 gallons of foam concentrate. Does incident command have access to 68 totes of foam following extinguishment? If local foam supplies do not add up, how will foam stocks be replenished? How long will it take to arrive?

Flammable liquids fire scenarios are often chaotic, "fluid" situations. They can also easily outstrip localised resources and response capabilities. Remember the adage "Proper Planning Prevents Poor Performance". Prepare for immediate and long-term needs for effective Industrial fire response operations.

React Later or Plan to Respond Now

Your local AHJ (authority having jurisdiction) should do a thorough site assessment to correlate potential incident risks with the operational profiles of the facility, such as drilling, storage, movements and chemical processing. Then consider fixed-systems response effectiveness, available portable response assets for supplemental or even primary response options, and the effective response capabilities of localised on-site and mutual aid personnel based on these risks.

As the late Jerry Craft, Fire Chief for Exxon would say, "Make your friends before you need them".

Following clear characterisation of potential site-specific response scenarios, all networks of response and governing authorities including local/regional police authorities, civil defence, coast guard and fire departments should be organised to establish clear communications processes and delegation of authority in the event of an incident. Developing a pre-incident plan should enlist the contributions of these bodies to assure it is both comprehensive and efficient. Response training should also emulate a full engagement of these entities where possible to practice all aspects of emergency response and emergency response management, such as fire response tactics, manpower accountability and safety programs, incident communications and logistics management.

The Industrial fire emergency is unique and varied in complexion due to chemical processes, flammable liquid chemistry and behaviours, the presence of dynamic operational characteristics such as pressurised gases and other extenuating circumstances that can drive the event.

Industrial Fire Response Personnel should be educated about many key event influencers and response tactics including:

- Fire chemistry: hydrocarbons vs alcohols.
- Fuels-in-depth fires.
- Three-dimensional fire.
- Pressurised vessels.
- Foam types and their applications.
- HydroFoam and HydroChem tactics.
- Foam calculations and proportioning.
- Large-volume field hydraulics.
- Industrial apparatus.

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Brent Gaspard is Manager Marketing Communications at Tyco Fire Protection Products

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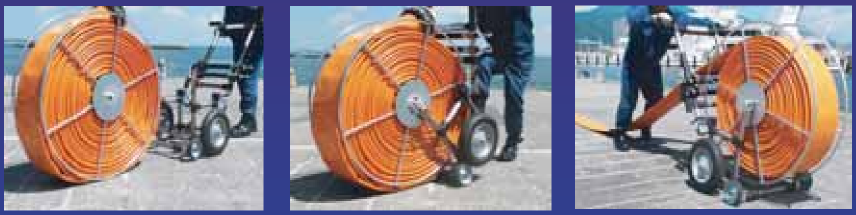

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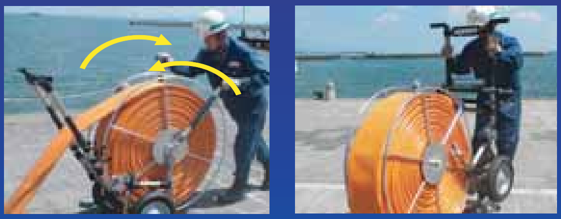

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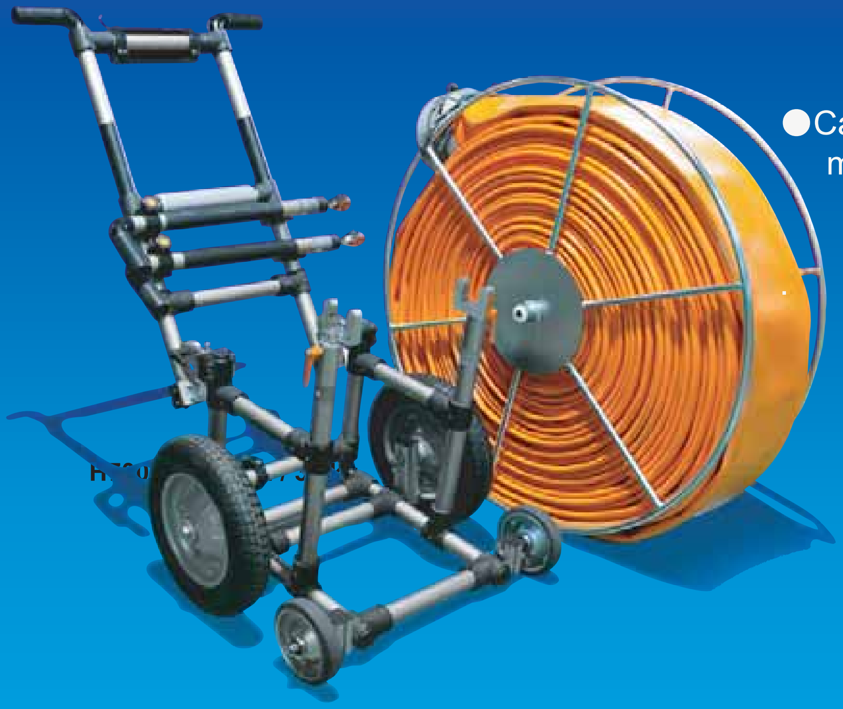

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LH-200	150-250	30m
LH-300	250-300	20m

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A Clear Insight into Thermal Imaging Cameras

Raymond Boh

Dräger Safety Asia

For firefighters, there is no better advice than hearing it from a veteran. Bob Athanas, a firefighter with 30 years' experience and founder of North America's Safe-IR, recently worked alongside Dräger Safety Asia to carry out training on the latest thermal imaging cameras (TICs). Combining an informative seminar with hands-on training using state-of-the-art equipment in realistic conditions, the attendees were able to both discuss and experience the harsh actualities of fire and rescue.

The event kick-started in Singapore and was attended by firefighters as well as key account customers who were already using TICs.

Athanas instructs firemen in the USA, Europe and Asia and is equally passionate about the use of TICs as a life-saving technique as he is about his work as a firefighter. The seminar allowed him to share his vast "on-the-job" experience, discussing it with the attendees and focusing their minds on the different ways that difficult situations can be handled.

He emphasised that having a TIC does not replace good job skills, techniques or common sense but it does, during a fire situation, significantly reduce frustration and anxiety. He also commented that once new recruits had confidence in their other equipment, it could help to cut down their learning curve. Athanas feels that, in a dynamic fire scene, a TIC can put firefighters ahead of the game. He further explained how cameras like the Dräger UCF series could make their life easier, how it could put them at an advantage within the fire scene and how it could save time as well as, potentially, life.

Athanas commenced his seminar with the

fundamentals of TIC; the history, how it works, and the up and down sides of a TIC. Equipping the users with such detailed information allowed them to fully understand how a TIC works, enabling them to utilise the various technological features as and when they need to.

Athanas also shared several videos that he had taken while using TICs. When presenting these different fire situations, he explained how the camera could assist in gathering information when faced with different challenges. He showed that recognising and interpreting this information would enable the best plan of action to be determined, and also demonstrated how the camera could make firefighting more efficient in virtually every emergency situation, whether it be a fire or the removal of dangerous materials.

One example that he gave was how the TIC should be held when a firefighter is confronted by stairs. With the correct angle between the TIC and body position, firefighters can traverse the stairs safely, even in poor visibility.

The delegates learned from his vast experience and heard how he treats a fire scene as a jigsaw puzzle; piecing the information together bit by bit based on procedures, experience, knowledge and common sense. In this scenario, the camera is used to its greatest potential, fitting the missing piece into the puzzle to create the whole picture.

Realistic Training

In Australia, firefighters were shown exactly how the new Dräger UCF 6000, 7000 and 9000 can penetrate hazards such as darkness and dense smoke to bring clear vision and clarity to confusing situations.

Athanas knows that firefighters rarely work in the light of a blazing fire and that most people are rescued from rooms filled with dense smoke that even a flashlight cannot penetrate. For this reason, the most realistic scenario was provided at accredited training facilities. Located behind a steel door, he created an intense wood and grass fire and set a search and rescue task that involved both locating the source of the fire and saving lives.

Motivated by a desire to help save victims while making the job safer for firefighters themselves, Athanas joined the firefighters with a Dräger UCF TIC. Wearing protective clothing and breathing apparatus, the team made its way inside and found that the TIC was soon outlining walls and objects such as chairs, a tricycle and, most importantly, a human form.

Christian Ferris, Market Segment Manager at Dräger Australia explains, "When a firefighter is met with a seemingly impenetrable mass of dark, thick smoke, not being able to see takes on a whole new meaning. At first sight, a TIC may appear to be pretty straightforward when it comes to standard applications but, in fact, it has much, much more to offer. Blinded by smoke without it, suddenly firefighters can see. Not only that but they are able to literally look around corners, determine temperatures, indicate thermal movements and discern glowing embers."

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Being able to see the "whole picture" is essential for fast, accurate decision making. The wide thermal operating range of the UCF camera, for example, allows the traditional modes of "firefighting" and "normal" to be viewed simultaneously, enabling the user to see both the fire source and other objects, including people, in a single clear image. In effect, it translates infrared images into precise contours.

While quick identification of a hazard or individual is vital when scanning an area, it is equally important that nothing is overlooked. Choice of mode and enhanced shutter speed provides sharp, clear images of the incident during initial evaluation. This clarity of vision was demonstrated inside the hostile training. The screen highlighted increased temperatures in one corner and thermal movements on the left indicating a staircase funnelling heat upwards. Despite the dense smoke conditions, the camera also picked out an overturned cupboard, a sofa and a piano.

Ferris knows that having the technology at hand is not enough. It is essential that operators are proficient in its use, that they try it out and understand exactly what it can do. He says: "It is incredible to see a users' reaction when they realise how they might benefit from the device in an emergency". He adds, "The operator should know both the theory and the practice behind its use in order to fully understand the various functions as well as the colour conversions and measurement fluctuations that will help with their decision making."

For instance, when entering a new area such as a doorway, hatch, window, confined space or turning a corner, the Dräger UCF user can select a freeze-frame facility to view hidden dangers. Providing a clear snapshot of the immediate vicinity, this allows the firefighter to observe the space, decide a plan of action and, if necessary, consult with colleagues before entering the danger zone. If required, these images can be recorded for post event or immediate, on-site playback for further training and evaluation purposes.

It is obviously imperative that any thermal changes are identified easily, regardless of the lighting conditions. When moving between rooms and buildings or even into bright daylight, the integral ambient light sensor on the UCF automatically adjusts the screen so that the image remains clearly visible.

This requirement for visibility despite the ambient conditions was clearly identified as the training continued in a second building, this time away from the smoke but in intense darkness.

Ferris adds, "For firefighters who are used to groping their way through the dark and calling out what they can feel, the use of the camera makes the work safer, faster and more thorough. Depending on how it is turned in a long and dark corridor, for example, the perspective on the display will increase in size to reproduce the ceiling and floor, all within just a few seconds.

"Often deployed to find glowing embers after dowsing, traditional thermal imaging cameras were usually left in the appliance until the fire was mostly extinguished. With cameras such as the UCF these kinds of hot spots, which are often invisible to the naked eye, can now be easily identified via the integrated laser pointer that pinpoints the exact location of any thermal area.

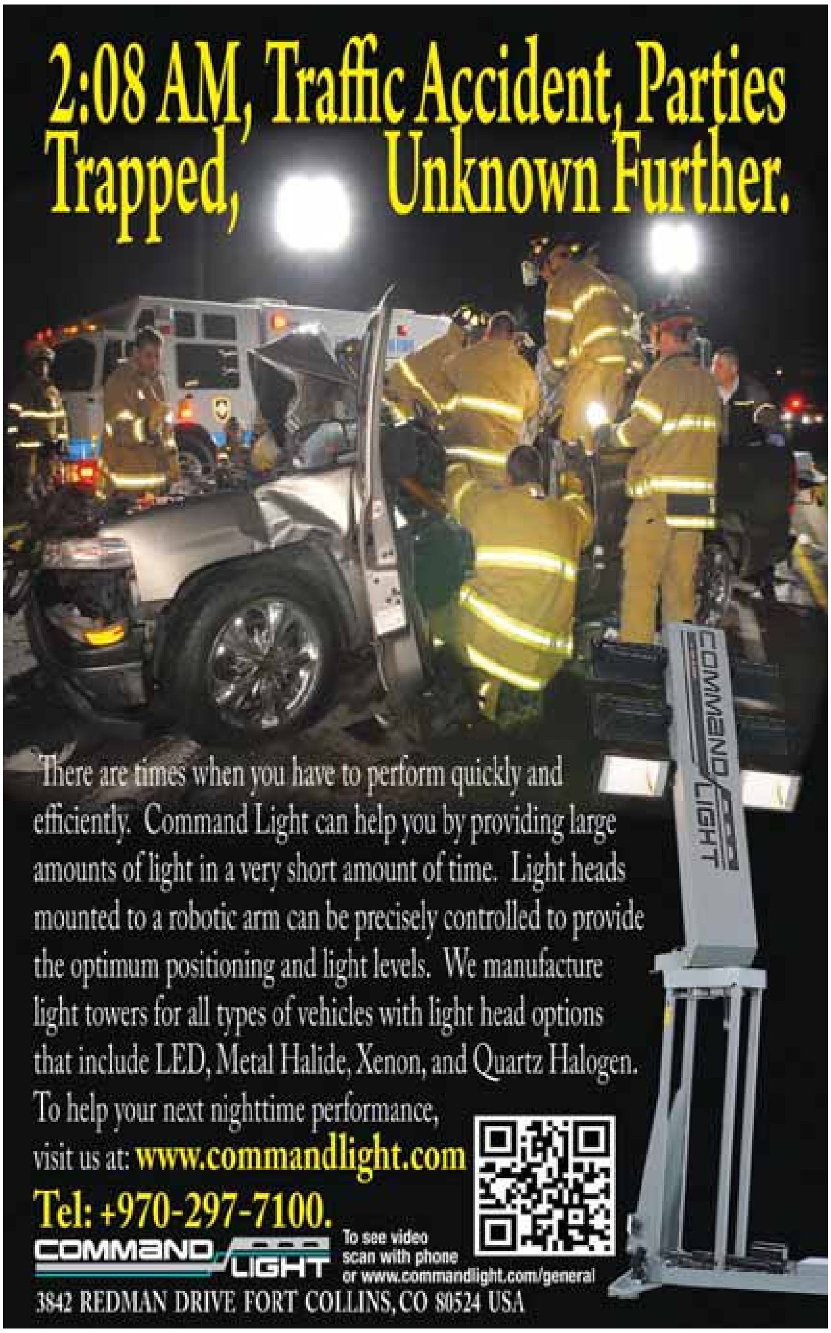
Thanks to technology of this kind, TICs can now be really pro-active and are being deployed to find victims, to evaluate fires and to carry out operations involving explosive materials.

Latest Technology

Weighing in at just 1.4kg, Dräger UCF cameras are thumb-operated and are easy to use even when wearing gloves. Operated single-handedly and leaving one hand free to deal with hazards or casualties, they switch between standard and other operational modes at the touch of a button.

In addition to the freeze frame function and laser pointer functionality the expanded, dynamic range of the UCF makes it possible to render highly detailed images of injured people close to fire, providing a clear picture despite the heat.

The cameras work by "seeing" an infrared field between seven and 14μm in wavelength and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convert the information into black and white video on a 9cm liquid crystal display. Optical materials such as protective window and a dual-lens wide angle are made of materials like germanium, a semiconductor that is both transparent to infrared and heat resistant. The measurement spectrum ranges from –40°C to plus 1000°C and allows for an operational temperature range of –40°C to +85°C in the camera core, withstanding temperatures of 150°C for up to 20 minutes and 260°C for ten minutes.

Unlike other cameras that have frequent shuttering where the image remains still for a moment while controls are toggled, the UCF camera has a very fast shutter speed that dramatically reduces blind spots and means that the presence of people or hidden dangers is not missed.

Efficient use of battery life can maximise camera readiness throughout the incident, particularly during long periods of operation. Providing more safety to the firefighter as a result of longer visual support, the auto standby function conserves the four-hour battery life when the camera is not being operated.

Due to the fact that the Dräger UCF 7000 and 9000 are intrinsically safe, they can be used even in environments that bear the risk of having a flammable atmosphere present (up to zone 1 – ATEX/IECEx).

The cameras are therefore able to provide valuable information is situations like HAZMAT operations or confined space entry.

As with many incidents, confined space entry can be difficult particularly when crawling and carrying a thermal imaging camera. An integral crawl handle ensures that firefighters can move more freely and allows the operator to use the camera effectively.

In terms of specification, the UCF 7000 has a resolution of 160 × 120 pixels and a 2× optical zoom, while the 9000 offers a 384 × 288 pixel resolution and a 4× optical zoom. The infrared window of the UCF 9000 offers the largest field of view. Whereas the UCF 7000 provides a large horizontal field of view of 47°, the UCF 9000 boasts 57° horizontally, which corresponds to a diagonal field of view of 74°.

"At the end of courses of this kind, it is not unusual for participants to comment that they had no idea they needed the training until they had attended the course. Similarly, they also feel that this kind of "trial by fire" is an excellent idea for any operational firefighter. Immediately after this particular training, one firefighter shared his real-life improved ability to save a casualty at a fire scene. He said the camera had worked perfectly and he had no doubts about the benefits of the device whatsoever. Job Done. APF

Raymond Boh is Regional Focus Group Manager Asia Pacific at Dräger Safety Asia

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Graham Collins

New Vehicles on the Scene

Firefighting vehicles are undoubtedly the most costly investment in equipment a fire department will ever make. Their design, functionality, unerring reliability and robustness are key considerations when making a purchasing decision, as can clearly be seen from the latest front-line vehicles to come on stream in the Asia Pacific region.

Australia's Giant Pumper

Austrian vehicle builder, ROSENBAUER, has recently supplied the Australian minerals group, Caltex, with a special foam pumper equipped with what Rosenbauer describes as "outstanding extinguishing technology".

The giant vehicle has been deployed to protect a petrochemical complex consisting of a refinery and a large tank farm near the New South Wales state capital, Sydney. Due to the fire loads and differing fire risks of the site, a primary requirement for the vehicle was that it had to be capable of emitting the largest possible volume of extinguishing agents in the shortest possible time. Consequently, the new pumper has no less than 4,000 litres of foam and 250kg of powder on board while, as is usual in the industry, unlimited supplies of water are available from hydrants. The blend of water, foam and – if required – dry powder, which constitutes the extinguishing agent mix, is applied either by means of two monitors, one on the vehicle roof and one at the tip of the turret arm, or via a quick attack. In addition, the vehicle is fitted with fully automatic extinguishing technology and remote controlled monitors and can therefore be operated for days or weeks without interruption.

The foam pumper was built at the Rosenbauer Group's headquarters in Leonding in Austria on a four-axle Scania chassis with two steered trailing axles. The superstructure of this massive truck conceals a combination of Rosenbauer's most powerful extinguishing components comprising an N100 normal pressure pump with an output of up to 14,000 litres-a-minute in hydrant operation and a Hydromatic direct injection foam proportioning system. The Hydromatic system provides infinitely adjustable proportioning rates and separate emission of water and water/foam mixtures via differing outlets. Both the pump and the proportioning system represent high-performance extinguishing technology, which has been specially developed for industrial operations.

Rosenbaurer has been building firefighting vehicles for over a century and since the 1990s has also been using its own chassis. The company possesses extremely specialised know-how in the chassis and drive train field, particularly with regard to the optimum transfer of drive energy from vehicle engines to the extinguishing systems. As a rule, this power transmission takes place using an auxiliary drive, but in Caltex's case a split shaft transmission is employed that enables the transfer of the entire power of the engine to the firefighting technology users. This means that 480hp (353 kW) is available for the pump, the foam proportioning system and the turret, which represents sufficient power for lengthy industrial operations.

Industrial firefighting vehicles of this type are generally produced singly or in very small batches, as they are precisely matched to the individual needs of the customer. In the case of Caltex, for example, the Hydromatic system is fitted with ten outlets of differing dimensions instead of the usual six. To meet the customer's requirements, changes were also made to the suction side of the vehicle, which was enlarged to include five hydrant intakes. In addition, various vehicle features such as the lighting, brakes and driving slope angle were manufactured and certified in line with Australian design regulations, in order that the vehicle qualifies for a road traffic license.

For more information, go to www.rosenbauer.com

Chinese Line-Up

No fewer than 46 new ROSENBAUER vehicles have been delivered to China: ten ultra-compact urban firefighting vehicles have gone to the Shanghai Fire Department; 12 aerial ladders with complete extinguishing equipment have been handed over to the Beijing Fire Brigade; and 24 large-scale-tank firefighting vehicles have been delivered to various Chinese fire departments.

The new vehicle solutions were specifically developed and built to meet the customer's needs. For example, the new urban firefighting vehicle for the Shanghai Fire Department is seven metres long, three metres high, and 200mm narrower than a standard truck with a width of just 2.3 metres. This 200mm makes all the difference if you need to travel fast on the mega city's five-lane freeways. With the new urban vehicle, the Shanghai Fire Department can intervene quickly, even in very heavy traffic, and it can easily negotiate narrow streets or low headroom. And the vehicle needs less space at the scene of the emergency. Due to its low height, it can do without equipment compartment covers, making it easier for other road users to pass by.

Despite this, the 13-tonne tank firefighting vehicle has everything that it needs for an immediate firefighting response on board. This includes 1,000 litres of water, 300 litres of foam compound, an NH35 normal/high pressure pump with a Fixmix foam proportioning system and a full set of extinguishing equipment.

To be able to house all of this in a compact superstructure, Rosenbauer positioned the tank at the centre of the vehicle, so creating space around the tank for compartmentation. Large-scale shutters on both sides of the superstructure facilitate operations. Besides the Shanghai Fire Department, the fire departments in Guangzhou and Shaoxing have also shown interest in this vehicle solution.

The 12 Rosenbauer/Metz aerial ladders handed over to the Beijing Fire Brigade brings the total supplied to the Chinese capital's brigade to 21.

This is an aerial ladder with complete fire extinguishing technology and a twin cab that is an aerial rescue device that additionally gives the fire department the option of an immediate firefighting response. The 28-tonne vehicle can accommodate a crew of one-plus-five firefighters; it is equipped with a combined water/foam tank of 3,000 litres of water and 700 litres of foam compound, and has a pump and foam proportioning system that can be controlled from the rear of the vehicle. A waterway along the four-part ladder supports a flow rate of up to 4,000 litres-a-minute. The cage is equipped with under-truck nozzles and a fixed monitor. A second monitor is mounted on the vehicle, as well as an RS14 power generating set.

The large-scale tank Type TLF 18000 CBS firefighting vehicle has 18,000 litres of extinguishing agent on board, a turret on the roof, and is equipped with powerful pumps and foam proportioning systems. It is deployed by both municipal and provincial fire departments in China with the aim of achieving the greatest possible extinguishing performance. Vehicles of this type have recently been delivered to the Liaoning Province Fire Department in the north east of China and to the fire department at the port of Qingdao.

For more information, go to www.rosenbauer.com

New Generation Korean Strikers

Three new generation OSHKOSH Striker aircraft rescue and firefighting vehicles have just been delivered to the Korea Airports Corporation, an airport management group that operates 14 airports located throughout the Republic of Korea.

The new Oshkosh front-line flagship vehicles are being deployed at Gimpo Airport, west of the capital city, Seoul, at Gimhae Airport near Busan in the south of the Republic, and at Jeju airport on the island of Jeju. They joined two Striker 3000 vehicles that were placed into service at Korea Airports Corporation managed airports in the middle of last year.

These new generation Strikers feature advanced safety systems and deliver what is described as innovative fire suppression technology, unmatched chassis performance, and unsurpassed reliability and durability. The 6x6 axle configuration, with Oshkosh TAK-4 all wheel independent suspension and an Oshkosh rear steering system, offers a smooth ride and excellent off-road capabilities. The 700hp, Tier 4i/Euro 5 emissions compliant turbo-charged engine is matched with a seven-speed electronic automatic transmission for smooth power delivery and a top speed greater than 113 kilometres-an-hour. The engine power pack components are readily accessed through walk-in doors on either side of the engine compartment for easier servicing.

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Protecting Firefighter's Respiratory Systems

Nowadays state of the art 21st century, modern day, lightweight ergonomically designed breathing apparatus with integrated telemetry systems are commonplace. However the question remains, is enough being done to protect the respiratory systems of fire fighters at today's fires?

Thomas Keane

Dublin Fire Brigade and Athlone Institute of Technology

Dr Carmel Kealey

Athlone Institute of Technology

Dr Damien Brady

Athlone Institute of Technology

Modern day firefighting is considered a science. Technologically we have come a long way since firefighters with heavy brass helmets and axes were required to grow facial hair. Their beards dampened and tied across their mouths with cloth acted as an improvised air filter when entering a burning building, the original Smoke Eaters. Progressing on from there were the very limiting smoke hoods and air pumps.

Today though, while fire brigades internationally are providing better PPE to firefighters, in particular breathing apparatus for respiratory protection, firefighters are still being exposed to lethal environmental toxicants from fire smoke. Why is this happening when modern day training methods and education far exceed training regimes of latter day brigades?

Firefighters understand that modern day fire smoke can be far more dangerous to individuals and that present day fire load contains copious amounts of toxic gas when compared to that of 30 years ago. Modern day materials, for example polyesters, can produce carbon monoxide, carbon dioxide, methane, ethane, butane, hydrogen and benzene. Another possible toxicant is polyvinylchloride (PVC), which is used in plastics for electrical installations, telephone and computer cables, children's toys and normal household goods.

Practically every type of structure today contains products capable of producing toxic gases and although extremely high temperatures of 600°C and above can be reached in modern compartment fires, PVC can decompose at temperatures as low as 150°C. Smoke concentrations at these temperatures can be extremely low; consequently there are minimal warning signs for firefighters of the amount of toxic gases being released during these stages of a fire, which can lead to a false sense of security and a more relaxed approach to dealing with the fire.

Legislation & Standards

Globally there are a number of standards or legislative acts that impose an obligation on fire brigade junior and senior management. This extends to ensuring their own safety, that of their colleagues and the general public. In Ireland, for example, the Safety Health and Welfare at Work Act 2005 is the primary legislation used to protect employees, and is broken down into a number of different sections and regulations as displayed in the table below.

Table 1. Safety Health and Welfare at work Act 2005

Section		Regulation	
No.	**Description**	**No.**	**Description**
8	Prevention of risk to health at work	63	Assessment of PPE
10	Provide instruction and training	64	Conditions of use
19	Identify hazards and risk assessment	65	Personal use
20	Produce safety statement	66	Maintenance and replacement
22	Health surveillance	131	Health surveillance records and effects
80	Directors liability		

Table 2. Classification of toxic gases in fire

Narcotic Toxic Gases	Acute Effects	Chronic Effects
Carbon Monoxide	Decrease oxygen levels Unconsciousness Increased risk of heart problems Asphyxiation	Reproduction problems Cardiovascular problems Central nervous problems
Carbon Dioxide	Asphyxiation/Frostbite Headaches Dizziness	Kidney damage or coma
Hydrogen cyanide	Death can occur within minutes or seconds of the Inhalation of high concentrations of cyanide. Low blood pressure (hypotension).	Chemically-induced hypoxia may involve changes in the cell microtubules and neurofibrils The heart is also particularly susceptible to chronic hypoxia due to the changes in acid-base balance and electrolytes which result from anoxia in cells
Irritant Toxic Gases	**Acute Effects**	**Chronic Effects**
Sulphur Dioxide	Very water-soluble; it readily dissolves in the mucus of the upper respiratory system bronchial constriction resulting in a measurable increase in flow resistance; this is due to changes in smooth muscle tone since $S0_2$ acts upon the sympathetic nervous system	Wheezing, mild dyspnoea, persistent cough and phlegm bronchial hyper-responsiveness; chronic respiratory disease and chronic obstructive pulmonary disease (COPD) symptoms
Acrolien	Acute exposure results in eye, skin, respiratory tract irritation Pulmonary edema	Chronic exposure results in cancer of the bladder and urothelial
Ammonia	Acute oral exposure results in pain, salivation and burns in cavity, nasopharynx, larynx and trachea, airway obstruction, respiratory distress and bronchiolar and alveolar Oedema	Chronic inhalation has been associated with increased cough, phlegm, wheeze and asthma
Hydrogen Fluoride	Irritation and pulmonary edema. Irritation of the eyes, nose, lacrimation, sore throat, cough, chest tightness, and wheezing. Severe ocular irritation and dermal burns may occur following eye or skin exposure fluorides	Chronic inhalation exposure of fluoride has resulted in irritation and congestion of the nose, throat, and bronchi. Increased bone density, renal injury, thyroid injury, anaemia
Nitrogen Dioxide	Nitrogen dioxide can cause death, collapse, rapid burning and swelling of tissues in the throat and upper respiratory tract, difficult breathing, throat spasms, and fluid build-up in the lungs. It can interfere with the blood's ability to carry oxygen through the body, causing headache, fatigue, dizziness, and a blue colour to the skin and lips	Genetic mutations, damage a developing foetus, and decrease fertility in women. Repeated exposure to high levels of nitrogen dioxide may lead to permanent lung damage. Unconsciousness, vomiting, mental confusion, and damage to the teeth, coughing, shortness of breath, fatigue, and nausea

Firefighter Exposure

Firefighters, due to the nature of the work they undertake, are frequently exposed to environmental toxic gases from fire smoke, including fumes, and as a result can succumb to both acute and chronic respiratory illness. Reports of the damage that toxic gases can cause to firefighters' health range from acute mild irritation of the eyes and upper airway tract and mucus membranes to chronic debilitating lung damage. Toxic gases in smoke can be differentiated into those that induce narcotic effects and those that act as irritants.

The Problem

When we consider that the PPE supplied to firefighters reaches all the relevant International and EN standards, the question remains, why are these toxic gases causing medical issues and posing such a significant health hazard?

To investigate this, the first logical step is to examine the procedures, operational guidelines,

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techniques, training and traditional customs used by 21st century firefighters to fight modern day fires.

Operational procedure in Ireland state that firefighters wear full breathing apparatus (BA) only on the command of their officer. This is after a dynamic risk assessment (DRA) specific to the incident has been completed. Some form of BA control is exerted by brigades no matter where in the world they operate. BA training is conducted to a very high standard in most fire brigades, not only are firefighters expected to undergo basic BA training but this is augmented by compartment firefighting training, on station BA drills and exercises and refresher training.

Due to the demographics and resources available in today's depressed economic society, when firefighters arrive it is normally to a fully involved fire. At this stage in the life cycle of the fire the amount of toxic gases given off by the fire are not as prolific. This can be attributed to the fact that complete combustion at a fully involved fire with unlimited amounts of oxygen leads to the majority of the toxic gases being burnt off.

Culture

Training styles, systems of work, structures, and staff generally make up the culture of the organisation. In general, fire brigades depend on operational staff to implement their safety programmes on the fire ground. Unfortunately most fire brigades seem to have acquired a macho persona and health and safety can be seen as being weak, timid and ineffectual. This can manifest in operational areas like not wearing respiratory protection at small fires, vehicle fires or fires in the open regardless of the amount of toxins or smoke being produced.

Although fire brigades operate a safe person concept, there remains the misconception among operational firefighters that the need for respiratory protection is minimal at these types of fires. This is not a taught behaviour, as firefighters are trained to read smoke in basic training, to understand the chemical reaction taking place and to protect themselves; therefore this must be a learned behaviour through the observation of custom and practice at operational fires.

The Reasons

Along with the learned behaviour of firefighters, the physical effort of wearing breathing apparatus in very arduous conditions, even with the new light weight sets available, is one of the reasons stated by firefighters for not donning their sets as soon as possible, and doffing their sets as soon as they exit the fire. Some of the disadvantages of wearing breathing apparatus are the equipment weight and size. This adds extra stress to the firefighter already under stress imposed by the fire conditions, and coupled with the exertion of climbing ladders, effecting entries, firefighting and rescuing victims is exhausting.

Firefighters are human with human fallibilities and can sometimes misread the circumstances and the need to wear breathing apparatus, and this normally correlates with their visual impression of smoke intensity at a fire.

Most fire brigades' breathing apparatus sets have facilities for the face mask to be removed from the back pack and regulator, allowing for an adaptor filter cartilage [APR] to be fitted that enables the face mask to be used as a respirator, although not all brigades utilise these facilities. Unfortunately some respirators can alter the breathing pattern of the user and therefore can increase the physiological stress firefighters operate under, and again the extra physical effort of breathing through a respirator after firefighting in extremely high temperatures is a reason given for failing to use respirator cartilages provided. Additional health-based studies on the use of APR's during the initial and damping down stages of a fire should be conducted to confirm their effectiveness. It would be desirable to correlate this information on exposure with health outcomes and the morbidity and mortality experience of firefighters.

Conclusions

It is clear that firefighters are at risk of developing both acute and chronic respiratory symptoms as well as obstructive airway conditions that can have life changing effects on firefighting personnel and their families. And while fire brigades, both Irish and international, supply PPE to highest applicable standards, train their firefighters to the highest level of competence, and attain their obligations under their relevant legislation, it does not seem to have remedied the situation. Unfortunately to address the inconsistencies in firefighter behaviour on the fire ground and so limit the effects on firefighters from environmental toxins released in fire smoke and improve the protection afforded fire fighter respiratory systems, management could consider the adaptation of a number of strategies.

Recommendations

- Fire brigades could consider the introduction of an appropriate safety officer at fire ground incidents with responsibility for the proper supervision and accountability for safe systems of work, as part of the overall incident command system thus relieving the incident commander of the need to micro-manage the safety of firefighters on the fire ground, and leaving commanders with one line of communications for the reporting of Health and Safety matters.
- An increase in the pre-determined attendance of fire appliances to provide extra firefighter numbers on the fire ground at the initial attendance would allow incident commanders the opportunity to rotate firefighting personnel and limit exposure.
- The Introduction of a comprehensive health surveillance programme for firefighters spanning their entire career, and a physical training schedule for firefighters that is age appropriate.
- A change in firefighter operational perception and behaviour is required. This should be done using pre-existing forums such as health and safety committees, safety representatives, trade unions and fire brigade management.

While the implementation of these strategies would go a long way to addressing the problem of protecting firefighters' respiratory systems and long term health, it also allows brigade management to comply with their legal obligations under the various applicable acts. We propose that adopting these strategies will not just reduce morbidity and mortality within the brigade but create long term financial savings for management. APF

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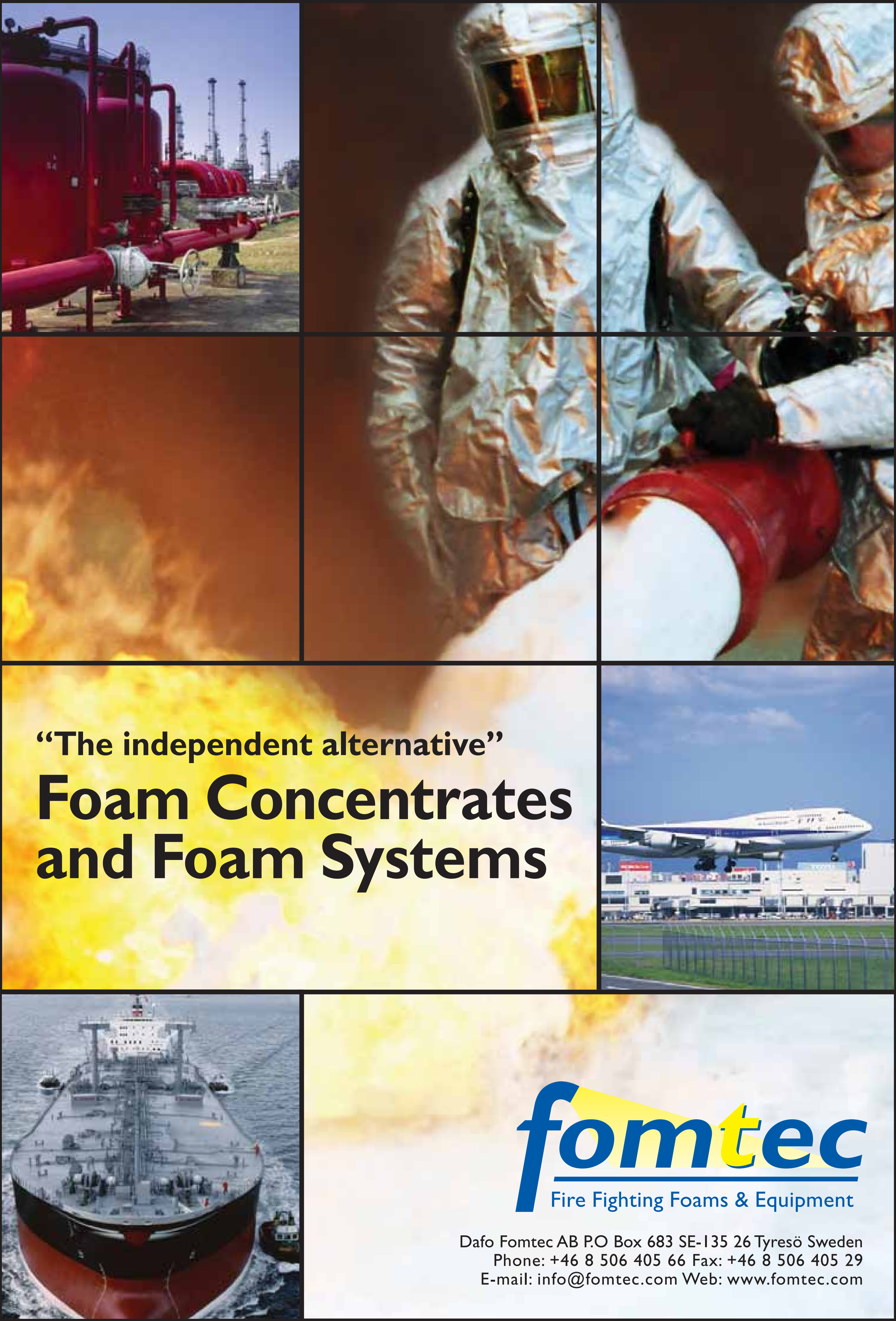

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The A-Foam Autho

Keith Klassen

A-Foam Authority

Most firefighters do not have a solid understanding of how and why Class A foam works, or how it can benefit their fire ground operations and safety. The A-Foam Authority, has been established to address these issues and assist fire departments in determining how best to apply foam technology in their department and their specific target hazards.

Class A foam is a valuable tool in the firefighter's arsenal. The use of Class A foam and compressed air foam systems has been slowly gaining popularity throughout the fire service over the last three decades. The objective in using Class A foam is to make water work better. Class A foam concentrate is a surfactant, or a "surface active" agent. When added to water, it reduces the surface tension of the water. This allows the water to spread into a thin sheet, increasing its surface area.

Because heat is only absorbed by the surface of the water, the increased surface area leads to quicker absorption of heat. Reduced surface tension also allows the solution to penetrate better into fuels. Surfactants also have an affinity for carbon. Adding surfactant to water makes the water "carbon loving." This keeps the water in contact with the fuels longer, providing more heat absorption and an increase in fuel moistures.

Foam bubbles are created by agitating air together with the foam solution, which is a combination of water and foam concentrate. These bubbles can be made in various forms, wet to fluid to dry, depending on the tactical application required. Wet foam resembles melted ice cream; it is wet and sloppy and water drains out of it quickly. It is used for extinguishing fire, mopping up and raising fuel moistures. Fluid foam looks and feels like shaving cream. It holds water much longer and is used to protect exposures. Dry foam contains a large volume of bubbles with very little water content. It can be used to fill void spaces such as attics or areas under decks.

There are many reasons to use Class A and compressed air foam. All of them apply in some respect to all fire departments. The importance of each however will vary depending on a particular fire departments organisation, staffing levels, equipment, location, and target hazards.

- **Firefighter safety:** providing additional firefighter safety is the most important reason for a fire department to adopt the use of Class A foam. Because foam is a more efficient extinguishing agent than water it allows firefighters to extinguish the fire quicker thereby being exposed to the situation for a shorter period of time. The high energy of a CAF stream provides a longer reach, allowing firefighters to operate farther away from the incident in a safer location.
- **Limited manpower:** compressed air foam does not replace manpower; people are still needed to perform fire ground operations ranging from fire attack to search and rescue, to ventilation and overhaul. It does allow the first arriving firefighters to do more in the first few minutes of the incident, which in turn positively affects the remainder of the incident.
- **Limited water supply:** when water supply is limited the use of foam extends the capability of the water supply. This may be a critical factor when no water supply is available and firefighters are relying on the water that they are carrying.
- **Wildland urban interface situations:** it may be multi-million dollar homes in heavily forested areas or simply overgrown vacant lots where a

rity

brush fire can threaten adjacent structures. Compressed air foam is very effective when used to protect homes and other property that are exposures in interface situations. Structures can be protected with a layer of foam and firefighters can move to a safe area before the fire arrives.

- **Improved fire investigation:** because foam is capable of quickly extinguishing the fire, less evidence will be destroyed leaving more for the investigator to examine. The lower total volume of water applied also leaves more of the evidence in place.
- **Environmental impacts:** lower volumes of water used means that less fire debris is washed out into the environment. Class A foam's attraction to carbon tends to remove carbon particulates from the smoke thereby keeping them out of the atmosphere.

In spite of these benefits many fire departments cite a variety of reasons not to use Class A foam. Some common reasons are:

- We have always used water.
- We have lots of water.
- We have lots of manpower.
- CAFS is too complicated to use.
- Foam is too expensive.
- It takes the fun out of firefighting.

It has been my experience that most firefighters do not have a solid understanding of how and why Class A foam works, or how it can benefit their fire ground operations and safety. This understanding is integral to both the acceptance of foam technology and the ability to properly operate both nozzle-aspirated foam systems (NAFS) and compressed air foam systems (CAFS).

The A-Foam Authority

This misunderstanding is due in a large part to two factors, lack of proper foam education and training, and inaccurate foam information that has circulated through the fire service. This is where the A-Foam Authority becomes a very important organisation for firefighters. An organisation has long been needed to address these issues and assist fire departments in determining how best to apply foam technology to their in their department and their specific target hazards. Such an organisation, The A-Foam Authority, has now been established.

The concept of the A-Foam Authority was conceived several years ago by a group of Class A foam users and foam industry leaders. The organisation had a slow start moving in several directions and working with a couple of different organisations to determine how it would be structured. In May 2011 the decision was made that the organisation should incorporate as a non-profit corporation. That process was completed in October 2011 and the A-Foam Authority NFP was officially established.

The organisation has a governing board whose current officers are:

President: Keith Klassen, Waterous.
Vice President: Rick Fix, Fire Research.
Karen Reed: Board Secretary, Phos-Chek.
Treasurer: Al Kloha, Circle K Service.
Member at Large: Dominic Colletti, Hale.

Four standing committees have been established to distribute and organise the work of the organisation. The committees are: membership, education, technical and marketing. Each committee has a Chairperson and Co-chairperson.

The costs of the organisation to date have been covered by some of the major foam equipment manufacturers, including Waterous, who funded the start-up of the website, Darley who funded the incorporation, and Hale who has funded the marketing efforts. The industry participants will be key in the organisation moving forward. The current dues structure requires dues for corporate members, however fire department and individuals can join free of charge.

The purpose of the A-Foam Authority as stated in the bylaws is: "The organisation exists for the purpose of promoting education about the use of Class A foam for firefighting to emergency services professionals so they can better serve their customers and communities." To accomplish this purpose the technical committee is currently sorting through information and articles submitted to them and will post only correct and accurate information on its website. This ensures that any information provided to organisation members will to accurate and useful.

The Education committee is currently working to establish base standards for Class A foam classes and training programs. Members can then be assured that any training endorsed by the A-Foam Authority will provide the appropriate information. The committee will also organise and provide foam training resources to its members.

Planning has begun to provide Class A foam symposiums in various locations that will provide classroom education and hands-on training. Along with providing education to firefighters we are working to identify opportunities to educate the leaders of emergency services, industry associations, communities, and insurance agencies on the benefits of Class A foam technology. The Marketing committee has begun promoting the organisation and informing firefighters of the services provided. The membership is actively recruiting new members, both fire department end users and industry manufacturers.

The membership numbers are growing daily. We would like to encourage any fire department or individual firefighter who is currently using Class A foam, is considering using foam, or would just like to learn about the technology to join the organisation. Membership to individuals is free and there is much the organisation can provide. We would also like to encourage all manufacturers of foam equipment and concentrates to join and help us build and strengthen the organisation. Your input is both needed and valued. We are also looking for people interested in participating on the standing committees. The more participation we have from the fire service the better we will be able to understand and meet the needs of the members. The Authority's President, Keith Klassen can be contacted on klassen@infomagic.net. APF

Keith Klassen is President of A-Foam Authority

For further information, go to www.afoam.org

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Email: hung.fang@utoronto.ca
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INDONESIA

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